

**BROOKINGS INSTITUTION, WASHINGTON, D.C.
INSTITUTE FOR GOVERNMENT RESEARCH**

**SERVICE MONOGRAPHS
OF THE
UNITED STATES GOVERNMENT
No. 42**

**THE HYDROGRAPHIC OFFICE
ITS HISTORY, ACTIVITIES
AND ORGANIZATION**

**AMS PRESS
NEW YORK**

THE INSTITUTE FOR GOVERNMENT RESEARCH

Washington, D. C.

The Institute for Government Research is an association of citizens for coöperating with public officials in the scientific study of government with a view to promoting efficiency and economy in its operations and advancing the science of administration. It aims to bring into existence such information and materials as will aid in the formation of public opinion and will assist officials, particularly those of the national government, in their efforts to put the public administration upon a more efficient basis.

To this end, it seeks by the thoroughgoing study and examination of the best administrative practice, public and private, American and foreign, to formulate those principles which lie at the basis of all sound administration, and to determine their proper adaptation to the specific needs of our public administration.

The accomplishment of specific reforms the Institute recognizes to be the task of those who are charged with the responsibility of legislation and administration; but it seeks to assist, by scientific study and research, in laying a solid foundation of information and experience upon which such reforms may be successfully built.

While some of the Institute's studies find application only in the form of practical coöperation with the administration officers directly concerned, many are of interest to other administrators and of general educational value. The results of such studies the Institute purposes to publish in such form as will insure for them the widest possible utilization.

Officers

Robert S. Brookings,
Chairman

Harold G. Moulton,
Vice-Chairman

Frederic A. Delano,
Treasurer

Trustees

Robert S. Brookings
Frederic A. Delano
George Eastman
Raymond B. Fosdick

Frank J. Goodnow
Jerome D. Greene
Vernon Kellogg

John C. Merriam
Harold G. Moulton
L. S. Rowe
Charles D. Walcott

Director

W. F. Willoughby

Editor

F. W. Powell

INSTITUTE FOR GOVERNMENT RESEARCH

SERVICE MONOGRAPHS
OF THE
UNITED STATES GOVERNMENT
No. 42

THE HYDROGRAPHIC OFFICE,
1
ITS HISTORY, ACTIVITIES
AND ORGANIZATION

BY
GUSTAVUS A. WEBER
11

THE JOHNS HOPKINS PRESS
BALTIMORE MARYLAND

1926

Library of Congress Cataloging in Publication Data

Weber, Gustavus Adolphus, 1863-
The Hydrographic Office.

Original ed. issued as no. 42 of Service monographs
of the United States Government.

Bibliography: p.

1. United States. Hydrographic Office.

L Title. IL Series: Brookings Institution, Washington, D.C.
Institute for Government Research. Service monographs
of the United States Government, no. 42.

VK597.U5W4 1974 353.008'232 72-3058

ISBN 0-404-57142-5

VK-597
.U5
W4
1974

Reprinted, with permission, from a volume in the
collections of the Newark Public Library

Reprinted from the edition of 1926, Baltimore
First AMS edition published, 1974
Manufactured in the United States of America

International Standard Book Number:

Complete Set: 0-404-57100-X

Volume 42: 0-404-57142-5

AMS Press, Inc.
New York, N.Y. 10003

54

**PUBLICATIONS OF THE
INSTITUTE FOR GOVERNMENT RESEARCH**

STUDIES IN ADMINISTRATION.

- The System of Financial Administration of Great Britain.**
By W. F. Willoughby, W. W. Willoughby, and S. M. Lindsay.
378 pp.
- The Budget.**
By René Stourm.
T. Plazinski, Translator; W. F. McCaleb, Editor. 648 pp.
- The Canadian Budgetary System.**
By H. C. Villard and W. W. Willoughby. 390 pp.
- The Problem of a National Budget.**
By W. F. Willoughby. 234 pp.
- The Movement for Budgetary Reform in the States.**
By W. F. Willoughby. 266 pp.
- Teachers' Pension Systems in the United States.**
By Paul Studensky. 474 pp.
- Organized Efforts for the Improvement of Methods of Administration in the United States.**
By Gustavus A. Weber. 408 pp.
- The Federal Service: A Study of the System of Personnel Administration of the United States Government.**
By Lewis Mayers. 624 pp.
- The Reorganization of the Administrative Branch of the National Government.**
By W. F. Willoughby. 314 pp.
- The Development of National Administrative Organization in the United States.**
By Lloyd M. Short. 531 pp.
- The Statistical Work of the National Government.**
By Laurence F. Schmeckebier. 590 pp.
- Manual of Accounting and Reporting for the Operating Services of the National Government.**
By Henry P. Seidemann. 421 pp.
- The National Government and Public Health.**
By James A. Tobey. 441 pp.

PRINCIPLES OF ADMINISTRATION.

- Principles Governing the Retirement of Public Employees.**
By Lewis Meriam. 508 pp.
- Principles of Government Purchasing.**
By Arthur G. Thomas. 290 pp.
- Principles of Government Accounting and Reporting.**
By Francis Oakey. 582 pp.
- Principles of Personnel Administration.**
By Arthur W. Procter. 256 pp.

PUBLICATIONS OF THE
INSTITUTE FOR GOVERNMENT RESEARCH

SERVICE MONOGRAPHS OF THE UNITED
STATES GOVERNMENT.

- The Geological Survey. 174 pp.
The Reclamation Service. 190 pp.
The Bureau of Mines. 174 pp.
The Alaskan Engineering Commission. 134 pp.
The Tariff Commission. 84 pp.
The Federal Board for Vocational Education. 86 pp.
The Federal Trade Commission. 92 pp.
The Steamboat-Inspection Service. 142 pp.
The Weather Bureau. 100 pp.
The Public Health Service. 312 pp.
The National Park Service. 184 pp.
The Employees' Compensation Commission. 98 pp.
The General Land Office. 236 pp.
The Bureau of Education. 172 pp.
The Bureau of Navigation. 136 pp.
The Coast and Geodetic Survey. 120 pp.
The Federal Power Commission. 138 pp.
The Interstate Commerce Commission. 182 pp.
The Railroad Labor Board. 96 pp.
The Division of Conciliation. 48 pp.
The Children's Bureau. 95 pp.
The Women's Bureau. 44 pp.
The Office of the Supervising Architect. 150 pp.
The Bureau of Pensions. 150 pp.
The Bureau of Internal Revenue. 283 pp.
The Bureau of Public Roads. 134 pp.
The Office of the Chief of Engineers. 178 pp.
The United States Employment Service. 142 pp.
The Bureau of Foreign and Domestic Commerce. 192 pp.
The Bureau of Immigration. 260 pp.
The Patent Office. 139 pp.
The Office of Experiment Stations. 190 pp.
The Customs Service. 203 pp.
The Federal Farm Loan Bureau. 171 pp.
The Bureau of Standards. 314 pp.
The Government Printing Office. 155 pp.
The Bureau of the Mint. 102 pp.
The Office of the Comptroller of the Currency. 96 pp.
The Naval Observatory. 113 pp.
The Lighthouse Service. 170 pp.
The Bureau of Animal Industry.
The Hydrographic Office. 124 pp.
The Bureau of Naturalization. 120 pp.

FOREWORD

The first essential to efficient administration of any enterprise is full knowledge of its present make-up and operation. Without full and complete information before them, as to existing organization, personnel, plant, and methods of operation and control, neither legislators nor administrators can properly perform their functions.

The greater the work, the more varied the activities engaged in, and the more complex the organization employed, the more imperative becomes the necessity that this information shall be available—and available in such a form that it can readily be utilized.

Of all undertakings, none in the United States, and few, if any, in the world, approach in magnitude, complexity, and importance that of the national government of the United States. As President Taft expressed it in his message to Congress of January 17, 1912, in referring to the inquiry being made under his direction into the efficiency and economy of the methods of prosecuting public business, the activities of the national government "are almost as varied as those of the entire business world. The operations of the government affect the interest of every person living within the jurisdiction of the United States. Its organization embraces stations and centers of work located in every city and in many local subdivisions of the country. Its gross expenditures amount to billions annually. Including the personnel of the military and naval establishments, more than half a million persons are required to do the work imposed by law upon the executive branch of the government.

"This vast organization has never been studied in detail as one piece of administrative mechanism. Never have the foundations been laid for a thorough consideration of the relations of all of its parts. No comprehensive effort has been made to list its multifarious activities or to group them in such a way as to present a clear picture of what the government is doing. Never has a complete description been given of the agencies through which these activi-

ties are performed. At no time has the attempt been made to study all of these activities and agencies with a view to the assignment of each activity to the agency best fitted for its performance, to the avoidance of duplication of plant and work, to the integration of all administrative agencies of the government, so far as may be practicable, into a unified organization for the most effective and economical dispatch of public business."

To lay the basis for such a comprehensive study of the organization and operations of the national government as President Taft outlined, the Institute for Government Research has undertaken the preparation of a series of monographs, of which the present study is one, giving a detailed description of each of the fifty or more distinct services of the government. These studies are being vigorously prosecuted, and it is hoped that all services of the government will be covered in a comparatively brief space of time. Thereafter, revisions of the monographs will be made from time to time as need arises, to the end that they may, as far as practicable, represent current conditions.

These monographs are all prepared according to a uniform plan. They give: first, the history of the establishment and development of the service; second, its functions, described not in general terms, but by detailing its specific activities; third, its organization for the handling of these activities; fourth, the character of its plant; fifth, a compilation of, or reference to, the laws and regulations governing its operations; sixth, financial statements showing its appropriations, expenditures and other data for a period of years; and finally, a full bibliography of the sources of information, official and private, bearing on the service and its operations.

In the preparation of these monographs the Institute has kept steadily in mind the aim to produce documents that will be of direct value and assistance in the administration of public affairs. To executive officials they offer valuable tools of administration. Through them, such officers can, with a minimum of effort, inform themselves regarding the details, not only of their own services, but of others with whose facilities, activities, and methods it is desirable that they should be familiar. Under present conditions services frequently engage in activities in ignorance of the fact that the work projected has already been done, or is in process of execution by other services. Many cases exist where one service could

make effective use of the organization, plant or results of other services had they knowledge that such facilities were in existence. With the constant shifting of directing personnel that takes place in the administrative branch of the national government, the existence of means by which incoming officials may thus readily secure information regarding their own and other services is a matter of great importance.

To members of Congress the monograph should prove of no less value. At present these officials are called upon to legislate and appropriate money for services concerning whose needs and real problems they can secure but imperfect information. That the possession by each member of a set of monographs such as is here projected, prepared according to a uniform plan, will be a great aid to intelligent legislation and appropriation of funds can hardly be questioned.

To the public, finally, these monographs will give that knowledge of the organization and operations of their government which must be had if an enlightened public opinion is to be brought to bear upon the conduct of governmental affairs.

These studies are wholly descriptive in character. No attempt is made in them to subject the conditions described to criticism, nor to indicate features in respect to which changes might with advantage be made. Upon administrators themselves falls responsibility for making or proposing changes which will result in the improvement of methods of administration. The primary aim of outside agencies should be to emphasize this responsibility and facilitate its fulfillment.

While the monographs thus make no direct recommendations for improvement, they cannot fail greatly to stimulate efforts in that direction. Prepared as they are according to a uniform plan, and setting forth as they do the activities, plant, organization, personnel and laws governing the several services of the government, they will automatically, as it were, reveal, for example, the extent to which work in the same field is being performed by different services, and thus furnish the information that is essential to a consideration of the great question of the better distribution and coördination of activities among the several departments, establishments, and bureaus, and the elimination of duplications of plant, organization and work. Through them it will also be possible to

subject any particular feature of the administrative work of the government to exhaustive study, to determine, for example, what facilities, in the way of laboratories and other plant and equipment, exist for the prosecution of any line of work and where those facilities are located; or what work is being done in any field of administration or research, such as the promotion, protection and regulation of the maritime interests of the country, the planning and execution of works of an engineering character, or the collection, compilation and publication of statistical data, or what differences of practice prevail in respect to organization, classification, appointment, and promotion of personnel.

To recapitulate, the monographs will serve the double purpose of furnishing an essential tool for efficient legislation, administration and popular control, and of laying the basis for critical and constructive work on the part of those upon whom responsibility for such work primarily rests.

CONTENTS

CHAPTER	PAGE
FOREWORD	vii
I. HISTORY	I
Early efforts for the establishment of an astronomical observatory	2
Establishment of a Depot of Charts and Instruments	8
Erection of a permanent depot and observatory	13
Systematic hydrographic, meteorological, and magnetic work of the depot	17
Astronomical work of the depot	20
Legal status of the Depot of Charts and Instruments	23
The Hydrographic Office, 1866 to 1926	26
Organization and administration	27
Nautical charts	28
Surveys and explorations	30
Meteorological and magnetic observations	33
Dissemination of navigational information	36
Ice patrol	37
International hydrographic conferences	37
World war activities	39
Executive heads of the Depot of Charts and Instruments and the Hydrographic Office	39
II. ACTIVITIES	41
Hydrographic and topographic surveys	47
Collection of navigational information	50
Preparation of charts and other nautical publications	52
Dissemination of navigational information	56
III. ORGANIZATION	59
Office of the Hydrographer	59
Division of Administration	59
General Administration Section	60
Files and Archives Section	60
Administration and Finance Section	60
Purchase and Supplies Section	61
Division of Maritime Security	61
Nautical Data Section	62
Aerial Navigation Section	62
Light Lists Section	62
Notice to Mariners Section	62
Pilot Charts Section	62
Route Information Section	63
Sailing Directions Section	63
Division of Nautical Research	63

CHAPTER	PAGE
Division of Chart Construction	64
Ocean and Lakes Surveys Section	65
Construction Section	65
Compilation Section	66
Reconstruction Section	66
Drafting Section	67
Engraving Section	67
Lithographic Section	67
Division of Distribution	68
Chart Stock Section	68
Catalogues and Proof Reading Section	69
Issue Section	69
Mailing Lists Section	69
Branch offices	70
APPENDIX	
1. Outline of Organization	72
2. Classification of Activities	79
3. Publications	80
4. Laws	90
5. Financial Statement	95
6. Bibliography	103
Index	109

THE HYDROGRAPHIC OFFICE

ITS HISTORY, ACTIVITIES AND ORGANIZATION

CHAPTER I

HISTORY

The Hydrographic Office is a service attached to the Bureau of Navigation of the Navy Department.¹ The functions of the Bureau of Navigation are mainly military, but it is also charged with the upkeep and operation of the Naval Observatory, and the Hydrographic Office, and of all ocean and land surveys of the Navy Department.

The functions of the Hydrographic Office are to make topographic and hydrographic surveys on the high seas and in foreign waters and to collect and disseminate hydrographic and navigational data; to prepare and print maps and charts relating to and required by navigation; and to prepare and issue navigators' sailing directions or "pilots," light lists, pilot charts, and navigational manuals, periodicals, and radio broadcasts for the use of navigation.

The hydrographic work on the coasts of the United States and its noncontiguous territories is performed by the Coast and Geodetic Survey of the Department of Commerce, and on the Great Lakes by the Office of the Chief of Engineers of the Department of War.

Prior to the enactment of the law of June 21, 1866, the functions of the Hydrographic Office and of the Naval Observatory were performed under the same direction and in the same office, the Depot of Charts and Instruments, and the early histories of these two organizations are so interrelated that they are considered

¹ There is also a Bureau of Navigation in the Department of Commerce which must not be confused with this bureau of the Department of the Navy. See Institute for Government Research, Service Monograph No. 15.

together. The historical account of this early period here given is therefore identical with that published in the monograph on the Naval Observatory of this series.

Early Efforts for the Establishment of an Astronomical Observatory. The earliest congressional action leading to the establishment of a national astronomical observatory resulted from a memorial to that body from an amateur astronomer, William Lambert, dated December 15, 1809, suggesting the establishment of a first meridian in the United States at the permanent seat of the government. Lambert had determined the longitude of the Capitol in Washington, and submitted his calculations with the memorial to Congress.

This memorial, with the accompanying papers, was referred to a select committee of the House of Representatives, which committee on March 28, 1810, made a favorable report to the House,¹ in which the following resolution was proposed:

Resolved, That it is expedient to make provision, by law, authorizing the President of the United States to cause the longitude of the City of Washington, from the observatory at Greenwich, in England to be ascertained with the greatest degree of accuracy; and also authorizing him, for that purpose, to procure the necessary astronomical instruments.

The report of this committee was laid on the table, but on January 23, 1811, it was referred to a second select committee.² This committee appears to have been discharged at its own request, and the memorial, with accompanying papers and astronomical calculations, was referred on February 23, 1811, to the Secretary of State for an opinion. In his reply, communicated to the House of Representatives July 3, 1812, James Monroe, Secretary of State, said:³

In admitting the propriety of establishing a first meridian within the United States, it follows that it ought to be done with the greatest mathematical precision, . . . For this purpose an observatory would be of essential utility. It is only in such an institution, to be founded by the public, that all the necessary imple-

¹ American State Papers, Misc., Vol. II, p. 53.

² House Journal, January 23, and February 23, 1811.

³ American State Papers, Misc., Vol. II, p. 195.

ments are likely to be collected together, that systematic observations can be made for any great length of time, and that the public can be made secure of the result of the labors of scientific men. In favor of such an institution it is sufficient to remark, that every nation which has established a first meridian within its own limits has established also an observatory.

Monroe's letter was referred to a third select committee on December 8, 1812, which on January 20, 1813,⁶ reported "That in their opinion, astronomical observations are highly useful to a navigating and commercial people," and that "the most ready method of obtaining the information to be derived from noting the phenomena of the heavens, is by the establishment of an observatory. This may be erected at the City of Washington. By such an institution means may be adopted not only to fix the first meridian, but to ascertain a great number of other astronomical facts and occurrences through the vigilance of a complete astronomer."

The report was read a second time and referred to the committee of the whole house for January 22, 1813, but nothing further was done in the matter at that time.

On February 2, 1815, Lambert's original memorial was again referred, with the several reports and Monroe's letter, to a select committee of the House of Representatives, which reported on February 18,⁷ recommending the carrying out of Lambert's plan by the establishment at public expense of an astronomical observatory and providing suitable instruments. It also recommended that the President of the United States be requested to cause further observations to be made to determine the exact longitude of the Capitol and that the results and data be laid before Congress at its next session. A resolution embodying the committee's recommendations was adopted February 18, 1815, but the President took no action under this resolution on the ground that it was not a joint resolution but was agreed to by the House of Representatives alone.⁸

In November, 1818, Lambert presented another memorial to Congress in which he claimed that the abstract of astronomical

⁶ American State Papers, Misc., Vol. II, p. 197.

⁷ *Ibid.*, pp. 273 and 759.

⁸ *Ibid.*, p. 759.

calculations to ascertain the longitude of the Capitol, for the establishment of a first meridian according to the original plan of the city, was founded on the most accurate data obtainable when the observations were made, and that they had been admitted by the American Philosophical Society of Philadelphia into a volume of their transactions.¹ In this communication he did not urge the immediate erection of an observatory but solicited "the adoption of a concurrent resolution of the two Houses of Congress, authorizing additional observations to be made to test the accuracy of the result already obtained, by such methods as may be best adapted to insure a correct determination of our longitude from Greenwich."

This memorial was referred to a select committee, which on February 24, 1819,² reported the joint resolution asked for. This resolution was finally passed March 3, 1821 (3 Stat. L., 648), and the President on April 10, 1821, appointed Lambert, who was instructed "to make astronomical observations by lunar occultations of fixed stars, solar eclipses, or any approved method adapted to ascertain the longitude of the Capitol from Greenwich."³

Lambert's report, dated November 8, 1821, was submitted to Congress January 8, 1822.⁴ In it he gave the mean results obtained by different methods employed for determining the longitude of the Capitol. He closed his report with a recommendation for the establishment of an astronomical observatory in the following words:

The legislative and executive authorities of the National Government will decide on the utility or expediency of erecting an observatory and furnishing it with suitable instruments and apparatus. Without such an institution the right ascension, declination, longitude, and latitude of the moon, planets, etc., cannot be ascertained with sufficient accuracy; and any attempt to compile a nautical almanac or astronomical ephemeris for ourselves would be futile, if not preposterous. Until an observatory be erected and furnished, we shall be compelled to rely upon the labors of scientific men for the elements necessary to be used in our astronomical calculations.

¹ Philosophical Transactions (New Series), Vol. I, p. 102.

² American State Papers, Misc., Vol. II, pp. 546, 769.

³ Message of President Monroe, January 8, 1822.

⁴ American State Papers, Misc., Vol. II, p. 753.

Supplementary reports by Lambert were submitted to Congress by the President on March 12, 1822,²² and December 23, 1823. The latter was referred to the Joint Committee of the Library, and a report was made upon it February 25, 1824,²³ but laid on the table, and there appears to be no record of any subsequent action on the matter.

One of the most ardent advocates of an astronomical observatory was John Quincy Adams, who as President, and subsequently as a member of Congress, persistently endeavored to secure legislation for its establishment.

In his first message to Congress, dated December 6, 1825, President Adams urged the establishment of a national university in which he said: "Connected with the establishment of an university, or separate from it, might be undertaken the erection of an astronomical observatory, with provision for the support of an astronomer, to be in constant attendance of observation upon the phenomena of the heavens, and for the periodical publication of his observations."

This part of the President's message was referred to a select committee, which presented on March 18, 1826, an elaborate report²⁴ prepared by Major-General A. Macomb, Chief of Engineers of the War Department, designating a suitable position for an observatory and indicating the proposed duties and responsibilities of the astronomer to be placed in charge. The committee also submitted a bill for the establishment of an observatory in the District of Columbia. Attention was called in the report to the fact that the requisite instruments and books for such an observatory were already in the possession of the government, and an estimate was made of \$14,500 for the cost of erecting the observatory, and \$4000 for the annual cost of operation. General Macomb recommended that "As soon as circumstances would permit, a nautical almanac or astronomical ephemeris should be prepared and published for the use of the Navy and commercial marine." These requisite instruments which had been procured for the Survey of the Coast during Jefferson's administration, instead of being set up and applied to their proper uses, were, at

²² American State Papers, Misc., Vol. II, p. 794.

²³ House Journal, February 25, 1824.

²⁴ 19 Cong. 1 sess., H. rep. 124.

this time stored away in one of the rooms of the War Department. Accompanying General Macomb's report were a letter from Major Kearney, his subordinate, giving details of a plan for an observatory building, and a letter from an attaché of the Russian legation, De Wallenstein, pointing out the advantages to be expected from such an institution.

The committee's report and bill were committed to the committee of the whole house for the following Monday, but the House Journal shows no further trace of them, and no action appears to have been taken on this matter for several years.

In response to a letter of inquiry from the chairman of the House Committee on Naval Affairs, the Secretary of the Navy, in a letter dated March 18, 1830, gave the following reasons for the establishment of an astronomical observatory :

1st. In a national point of view, as it would furnish the means of making such observations as would enable astronomers to ascertain or calculate the positions of the heavenly bodies at any time without being dependent on other nations for the same; and would be, moreover, a fixed point to whose meridian (commonly called a first meridian when used for geographical purposes) terrestrial objects may, with certainty, be referred, as far as respects their longitudes.

2d. It would, furthermore, be desirable in a scientific point of view, as it would present the means of comparing certain astronomical results, for the purpose of determining the figure of the earth and improving theories relative to the motions of the planetary bodies."

In a subsequent report, December 5, 1835, the Secretary of the Navy said :

A national observatory, although not immediately necessary to the defense of our country, is remotely so; and, considered with reference to the bearing it would have upon our Navy, our commerce, and scientific pursuits, it assumes an importance worthy of the consideration of Congress. . . . It would not be attended with any great expense. It is necessary now to employ an officer of science to keep our maps and charts, to regulate our chronometers, and to preserve all mathematical and philosophical instruments required for the Naval Service; and buildings are necessary for these purposes. These duties would probably devolve upon the Superin-

"Nourse, Founding and progress of the United States Naval Observatory, p. 12.

tendent of the Observatory; and the buildings necessary to such an establishment would be amply sufficient for the preservation of our maps, charts, and instruments."

There is no record of an endorsement of this proposition by the President, or of any congressional action in response thereto.

In June, 1838, when the Smithsonian bequest was received, John Quincy Adams entreated President Van Buren to recommend to Congress a definite plan for the foundation of a Smithsonian Institution, suggesting in connection therewith "the establishment of an astronomical observatory with a salary for an astronomer and an assistant for nightly observations, and periodical publications; annual courses of lectures upon natural, moral and political sciences." "

On October 14, 1838, Adams made a lengthy report, in response to a letter from the Secretary of States by direction of the President, in which he strongly advocated the establishment of an astronomical observatory out of the income from the Smithsonian bequest, and in which he laid down the principles for the disposal of the funds for this purpose.

On March 5, 1840, as chairman of a select committee of the House of Representatives on the Smithsonian Fund, Adams said:

The express object of an observatory is the increase of knowledge by new discovery. . . . There is no richer field of science opened to the exploration of man in search of knowledge than astronomical observation; nor is there, in the opinion of this committee, any duty more impressively incumbent on all human governments than that of furnishing means, and facilities, and rewards, to those who devote the labors of their lives to the indefatigable industry, the increasing vigilance, and the bright intelligence indispensable to success in these pursuits."

In his third report on the Smithsonian Fund," submitted to the House of Representatives, April 12, 1842, Adams again urged the establishment of a national observatory, and presented a bill for the appropriation of a portion of the income from the Smithsonian

"Nourse, *Founding and progress of the United States Naval Observatory*, p. 13.

"Quincy, *Memoir of the life of John Quincy Adams*, p. 287 (1858).

"27 Cong. 1 sess., H. rep. 277.

"27 Cong. 2 sess., H. rep. 587.

Fund for the creation of an observatory, the payment of the salaries of an astronomer and assistants, for the purchase of the best and most perfect instruments, for the purchase of a library of science and literature, and for the publication of astronomical observations and a nautical almanac. This bill was not enacted.

Another bill introduced in Congress the same year in response to certain citizens of Philadelphia, New York, and Baltimore, who had memorialized Congress to take measures for the reduction of astronomical observations and for the precise determination of the longitude of the Capitol, also failed of enactment.

The opinion is expressed in Quincy's Memoir²² that the powerful opposition to the establishment of an astronomical observatory during this period was due in a large measure to political enmity toward Adams. For many years, in every appropriation act by the terms of which there might have been a possibility of establishing an observatory, there was inserted the restriction "and to no other." In an act approved July 10, 1832 (4 Stat. L., 570, 571), providing for the survey of the coasts of the United States, the limitation was inserted. "that nothing in this act, or the act hereby revised, shall be construed to authorize the construction or maintenance of a permanent astronomical observatory." Even the measures to carry into effect the bequest of the Smithsonian Fund were defeated until the provision for an astronomical observatory was eliminated.

Notwithstanding this opposition in Congress, matters were shaping themselves in the meantime for the establishment of an astronomical observatory without specific legislation and in a way perhaps not contemplated by the early advocates or opponents of such an institution, and in this way Adams's desire was fulfilled some years before his death.

Establishment of a Depot of Charts and Instruments. Prior to the year 1830, each vessel of the Navy when fitted out obtained the necessary charts and instruments upon requisition by the commanding officer on the Board of Naval Commissioners, the purchases being made by a navy agent from foreign governments or from private dealers. No tests were made of the accuracy of the instruments and charts prior to their purchase. When a

²² Quincy, p. 414-15.

ship was put out of commission, its books, charts, and instruments were tumbled into store-rooms, where they remained, neglected, until needed for another vessel. Often they were found unfit for use after such storage.

In order to provide for the proper testing and examination of instruments and charts and for their care and preservation when not in use, the Board of Naval Commissioners, on November 29, 1829,²¹ made a recommendation to the Secretary of the Navy:

That an officer be appointed to take charge of all the nautical instruments, books, and charts not on board ship, to keep them in order for use when required. Among other duties he would be required to attend particularly to the time pieces, or chronometers, to ascertain precisely their character, such as their rate of deviation from time to time, whether they are affected by changes of weather, etc., for the information of those who may have to use them at sea. The character of each chronometer thus ascertained shall be delivered to the officer receiving the chronometer itself.

The following year, Lieutenant L. M. Goldsborough, calling attention to the Board's report, made the following specific suggestions for the establishment of a depot of charts and instruments.²²

First, That a suitable place be designated to serve as a general depot for all chronometers, instruments of reflection, theodolites, circles, telescopes, charts, etc., belonging to the Navy. At present, such instruments as are not on ship-board are dispersed about among the naval stores of our yards, in charge of individuals perfectly unacquainted with such matters, and corroding and becoming ruined for want of proper attention.

Second, That to this depot there be attached a competent officer, and an artist of known merit and capacity—the former to act under the immediate orders of the Navy Commissioners, to be made personally responsible for all instruments submitted to his charge, and especially required to determine the rates and characters of chronometers, to make it his duty to inform himself of all improvements and discoveries in connection with navigation, and to furnish upon requisitions, approved by the Navy Board, all ships fitting out with their necessary nautical apparatus; the

²¹ Navy Commissioners, Letters to the Secretary of the Navy, Vol. 3, p. 280. Files of the Navy Department.

²² Officers' Letters to Secretary of the Navy, Vol. IX, p. 53. Files of the Navy Department.

latter to repair, clean, adjust, assist in rating, etc. to the end that all instruments may be kept in proper order, and at all times ready for use. He should be required also to examine and test thoroughly all chronometers previous to their being purchased.

These suggestions of Lieutenant Goldsborough, having been approved by the Secretary of the Navy and the Board of Navy Commissioners, the Secretary, on December 6, 1830, ordered that a Depot of Charts and Instruments should be established in Washington, with functions practically as outlined in Lieutenant Goldsborough's letter. This officer, who was placed in charge of the Depot, was directed to collect from the commandants of various navy yards, the nautical instruments, books, and charts not in use, and transport them to the Depot. These were systematically arranged, marked, and put in condition for issue.

Among the functions of the Depot, as outlined in the Secretary's order, was the ascertaining of errors and rates of all chronometers sent to United States vessels being fitted out for sea. This was accomplished by means of sextant and circle observations. For this purpose a thirty-inch transit instrument was obtained and mounted in a circular building near the house rented for the Depot, on what is now G. Street, between Seventeenth and Eighteenth streets, N. W., in Washington. This was the first astronomical instrument for the Navy Department erected in Washington.

On July 31, 1831, an assistant, also a naval officer, was assigned to the Depot. It was made the duty of these officers, among others, to have charge of the purchase of all charts and chronometers, as well as the sale of such of the latter or of any nautical instruments, as were not adapted to the wants of the Navy, and the care and issue of charts and instruments furnished to United States vessels on fitting out for sea. All chronometers purchased by the Navy Department were submitted to tests at the Depot before they were accepted.

At the time of the establishment of the Depot, the charts and nautical books were purchased at private stores; they were nearly all of European origin and calculated from meridians to which our service was not accustomed; and the sailing directions were often in foreign languages. Upon Lieutenant Goldsborough's suggestion, he was directed by the Board of Navy Commissioners to make such modifications of the charts as would reduce them

to the meridian of Greenwich, England, and to translate the notations and instructions into the English language. A strong appeal was made by Lieutenant Goldsborough for the purchase of a lithographic press, but this was not authorized until some years later.

In 1833 Lieutenant Goldsborough was succeeded by Lieutenant Charles Wilkes, who in 1834 removed the Depot to Capitol Hill on a site originally proposed in 1816 by Ferdinand R. Hassler, Superintendent of the Coast Survey, about a thousand feet north of the dome of the Capitol, where it remained until July, 1842.

At this place, Lieutenant Wilkes erected at his own expense, an observatory sixteen feet square, and mounted a transit made by Edward Troughton in England for the Coast Survey in 1815 and loaned for the purpose by the Survey. This transit instrument had an object glass of $3\frac{3}{4}$ -inches aperture and sixty-three inches focal length. There were also installed a Borda circle, a $3\frac{1}{2}$ -foot achromatic portable telescope, a portable transit instrument, and a sidereal clock. It does not appear, however, that any regular series of observations were made at this time, except for the rating of chronometers.

In May, 1835, a lithographic press was installed at the Depot, and the work of chart production was begun. Consideration was now given by the Navy Department to the undertaking of original hydrographic work, and in 1836, Lieutenant Wilkes was instructed to proceed to Europe and purchase scientific instruments to be used for the Exploring Expedition, provision for which had been made by Congress in an act (May 14, 1836; 5 Stat. L., 27, 29), which authorized the President "to send out a surveying and exploring expedition to the Pacific Ocean and [the] South Seas, and for that purpose to employ a sloop of war, and to purchase or provide such other smaller vessels as may be necessary and proper to render the said expedition efficient and useful." The President was authorized to expend not to exceed \$300,000 for this purpose.

In the spring of 1837, Lieutenant Wilkes was relieved from duty at the Depot and was detailed to make a survey of the shoals of George's Bank, a work which was required by the act of March 3, 1837 (5 Stat. L., 157), and Lieutenant James M. Gilliss was placed in charge of the Depot.

In the winter of 1837-38, while Lieutenant Wilkes was surveying the entrance to Savannah River, Lieutenant Gilliss, made certain astronomical observations at his request, but these were never reduced.

In 1838 the United States Government sent out its first scientific expedition under authority of the act of May 14, 1836, and Wilkes, now a Commander, was placed in charge. The authority given covered explorations and surveys of the Pacific Ocean and the South Seas, "to determine the existence of doubtful dangers reported in the track of the United States trade, to make astronomical observations for locating shoals, islands, reefs, etc.; observations of terrestrial magnetism, variation of the compass, etc.; to instruct the natives of the islands visited in agriculture and horticulture, and to encourage them to increase their output; to discover if possible a shorter route to China *via* the Sulu Sea."²² The scientific staff of the Expedition included a philologist, two naturalists, a conchologist, a mineralogist, a botanist, a horticulturist, and two draftsmen.

The importance of observing corresponding moon culminations, occultations, and eclipses, in determining the differences of longitude between the observatory and the stations which the Expedition might occupy abroad was suggested to the Department at this time, and Lieutenant Gilliss at the Depot and William C. Bond at Boston were instructed under orders of the Secretary of the Navy dated August 13, 1838, to make such observations during the absence of Commander Wilkes. Provision was made at the same time by the Secretary of the Navy for the purchase of all necessary supplies and instruments for making a constant series of observations in astronomy, magnetism, and meteorology, and Lieutenant Gilliss accordingly obtained a portable forty-two-inch achromatic telescope, mounted parallactically [equatorially]; a variation transit; a comet seeker; an eight-inch dip-circle; and a sidereal chronometer; and subsequently, two clocks, one a sidereal and one a mean-time clock, and a balance magnetometer. The astronomical observations, made at the Depot under these instructions were begun in September, 1838, and continued to 1842.

²² Hydrographic Office, Annual Report, 1924, p. 40.

The purchase of these instruments and the taking of these continuous observations laid the foundation for the establishment of a permanent naval observatory.

The results of Wilkes' Exploring Expedition were ordered to be published by an act of Congress approved August 26, 1842 (5 Stat. L., 534), which provided "that there shall be published, under the supervision and direction of the Joint Committee on Library, 'an account of the discoveries made by the Exploring Expedition, under the command of Lieutenant Wilkes of the United States Navy'; which account shall be prepared with illustrations and published in form similar to the voyage of the *Astrolabe*, lately published by the Government of France." The act provided for the printing of one hundred copies, but subsequent acts provided for reprints and for their distribution. The publication appeared in the form of twenty-four quarto volumes and eleven atlases, issued at intervals from 1844 to 1874. Volume XXIII, Hydrography, by Wilkes, comprising 514 pages and an atlas containing 106 charts, was published in 1858-61.

In 1837 four engraved charts, being the first issue by the Navy Department, were published by the Depot from surveys made by American naval officers, and during the succeeding five years, eighty-seven such charts were issued, nearly all of which were the results of surveys made by the Exploring Expedition. The charts published by the Depot during its existence of about thirty-five years were engraved under contract by private parties.

Erection of a Permanent Depot and Observatory. The work of the Depot of Charts and Instruments, especially its hydrographic and astronomical work, had taken on such a character since its creation in 1830, that the accommodations became unsuitable and inadequate. From year to year, therefore, efforts were made by the Board of Navy Commissioners and by individual officers to secure the establishment of a permanent building for an enlarged Depot and an observatory.

Finally, on November 30, 1841, the Board of Navy Commissioners, at the solicitation of Lieutenant Gilliss, addressed a letter to the Secretary of the Navy, strongly urging an appropriation for such a permanent building. This recommendation was endorsed by the Secretary of the Navy in a report to the President.*

* Report of A. P. Upshur, Secretary of the Navy, December 4, 1841.

Subsequently a bill to that effect was introduced in Congress. After reference to the naval committees of the House and Senate, and much delay, the measure, known as the "Mallory bill," was approved August 31, 1842 (58 Stat. L., 576).

The activities, problems, and needs of the Depot of Charts and Instruments at that time are described in the following extracts from the report of the House Committee on Naval Affairs which accompanied this bill: "

Since its organization, the Navy has not only been furnished with better instruments and more recent charts, at a greatly less original cost than before, but greater care has been observed in their use. . . .

Prior to that time, chronometers were purchased as the wants of a ship or the judgment of a commander dictated, without trial or examination, the only guarantee of its value being the word of the seller. . . .

The same set of instruments rarely went to sea two cruises. When the ship returned, they were tumbled into the navy store, chronometers and all, where they remained till the fitting of a new ship would find them unworthy for further use. . . .

In the summer of 1838, the honorable Secretary of the Navy directed the superintendent to make a constant series of observations in astronomy, magnetism, and meterology, ordering an additional number of assistants, and granting authority for the purchase of all necessary instruments.

In the two latter sciences, the observations are made tri-hourly, throughout the day and night, from year's end to year's end; and, in the former, the average number of observations is three thousand annually. On a fixed day of each month, the magnetic instruments are observed, at intervals of two minutes and thirty seconds for twenty-four hours, making the total number of observations during the day, with those instruments alone, 576. . . .

Hydrography. It is particularly desirable that information on this subject should be collected from all quarters, as well for the navy as for the commercial marine generally; and there is, no doubt, a great mass of such information locked up in the memories of our whalers and Indiamen. . . . Yet from the fact that they know not where to send it, perhaps it never passes beyond the immediate crew.

The depot of charts and instruments is the proper receptacle of such information, till the organization of an appropriate hydrographic bureau. Let the captains of our merchant ships know they will be thanked for its communication, and receive credit as

public benefactors, and there can be no doubt, great pride will be taken in its transmission. . . .

Astronomy. We are indebted to other nations for the data which enables our ships to cross the ocean. Not only has the navy failed to contribute to the common stock from which all our navigators borrow, but our country has never yet published an observation of a celestial body, which bore the impress "by authority"; and it is believed that, until the observations before alluded to in this report, none have ever been directed by the Government which can be considered continuous. . . .

A small observatory is absolutely essential to the Depot; without it, the duties cannot be performed. . . .

Magnetism. . . . Without a knowledge of the variation of the compass, none but coasting crafts dare venture beyond the precincts of a harbor; yet how few have more than a practical knowledge of the mode of determining its amount. The daily changes of the variation, its extraordinary fluctuations during auroras, the causes, amounts, and modes of correcting the local attraction of ships, and, indeed, the laws governing magnetized bodies generally, are mysteries with which a large portion of the officers have had neither means nor opportunities to become acquainted. Great complaints are made that chronometers perform badly; that ships have been influenced by currents, when, if the true cause could be ascertained, it would be found to consist in having steered a wrong course, no allowance being made for local attraction. . . .

Meteorology. To be a good judge of the weather is considered an important qualification for a seamen; the safety of a ship and her crew may depend on the promptness and accuracy of his judgment. . . . If the theory [Professor Espy's theory of storms] is correct, the day is not distant when we shall be able, by means of a barometer and windvane, to calculate the precise point where a storm is raging. Navigators will thus be enabled to steer clear of it, and take advantage of the favorable winds blowing in its outer edge. Meteorological observations are more important at night than by day, because of their scarcity hitherto; . . . and we can only hope to obtain the desired information when those engaged in its pursuit have duty to compel a flagging inclination.

The act of August 31, 1842, authorized the Secretary of the Navy "to contract for the building of a suitable house for a depot of charts and instruments of the Navy of the United States on a plan not exceeding in cost the sum of \$25,000," and required "that the said establishment may be located on any portion of the public land in the District of Columbia which the President of the United States may deem suited to the purpose."

While the act made no mention of an astronomical observatory, and no specific legal provision had ever been made for the taking of astronomical observations, the site was selected and the building plans were made with the view of establishing such a permanent institution. Thus, in the very year when Congress finally refused to enact Adams's bill for an astronomical observatory, it enacted a law which made it possible for the Navy Department to establish such an institution.

The duty of preparing a plan for the new Depot was entrusted to Lieutenant Gilliss, who, after going abroad and consulting with distinguished European astronomers, submitted on November 23, 1843, designs and drawings for a building suitable both for a depot of charts and instruments and for an astronomical observatory. These plans were adopted and the work of construction was immediately begun. With reference to the astronomical work Lieutenant Gilliss said in a report (1845), that he would have regarded his time as misspent to labor so earnestly only to establish a depot of charts and instruments; that his aim was "to place an institution under the management of naval officers, where, in the practical pursuit of the highest known branch of science, they would compel an acknowledgment of abilities hitherto withheld from the service." "Regarding this only as a naval observatory," he continued, "it is of the utmost importance that we give the service the greatest possible benefit from it."

In his annual report for 1843, the Secretary of the Navy said, "It is proper to remark that this building is adapted in form and structure not only for a Depot of Charts and Instruments, but for an astronomical observatory."

The site chosen by President Tyler for this Depot was a knoll sometimes called Braddock Hill on the government reservation marked "No. 4" in the original plan of Washington, where the Naval Medical School Museum of Hygiene is now located, from Twenty-Third to Twenty-Fifth streets, N. W., and from E Street, N. W. ["University Square"], to what is now Potomac Park.

The new building being ready for occupancy the latter part of 1844, Lieutenant M. F. Maury, who had relieved Lieutenant

* 28 Cong. 2 sess., S. ex. doc. 114, p. 66. This is a report from Lieutenant Gilliss communicated by the Secretary of the Navy to the Senate, February 17, 1845. It gives a detailed description of the building erected and of the astronomical and magnetic instruments to be installed.

Gilliss as Superintendent of the Depot of Charts and Instruments, July 11, 1842, was ordered to take charge and to remove all the nautical books, charts, and instruments, with the officers, to the new quarters. The instruments and charts had been temporarily housed, since July 1, 1842, in a rented building known as 2222 and 2224 Pennsylvania Avenue, N. W.

Systematic Hydrographic, Meteorological, and Magnetic Work of the Depot. Lieutenant Maury, who took charge of the new depot and observatory on October 1, 1844, was inclined more toward the development of the hydrographic and meteorological work than his predecessor, who was, above all, an astronomer. While considerable work had been done in the field of hydrography by Wilkes and other officers, it was Lieutenant Maury who really laid the foundation for the systematic hydrographic work of the Navy Department.

Immediately upon taking charge of the Depot, Lieutenant Maury took steps to organize an extensive system of collecting information from the logs of men-of-war and merchant vessels. He succeeded in having observations made on a large number of ships, both in the Navy and Merchant Marine in all parts of the world, of the ocean currents, winds, air pressure and temperature, water temperature, and other marine and meteorological phenomena. In this way he was enabled to make charts of "the prevailing winds and currents, their general characteristics, and all the physical features of the ocean, including its meteorology, the limits of icebergs, the feeding grounds of whales, and all facts of interest and value to the maritime community."

The compilation of this information and the preparation of the charts, required the attention of a large part of the force at the Depot. Much difficulty was experienced, in the beginning, in obtaining the coöperation of the merchantmen.

The charts which were prepared from this material during Commander Maury's régime, 1844 to 1861, were known as "Wind and Current Charts." They consisted of six series, designated, respectively, as Track Charts, Trade-Wind Charts, Pilot Charts, Whale Charts, Thermal Charts, and Storm and Rain Charts.

²¹ 49 Cong. 1 sess., S. rep. 1285, pp. 26, 27.

The first three of the Track Charts were issued early in 1848 when copies were distributed gratuitously to naval officers and to the captains of merchant vessels who had contributed their logs. The charts covered the North Atlantic Ocean, and showed the tracks of a great number of vessels, the month in which each passage was made, the character of the weather, and the prevailing winds and currents encountered by each vessel. In 1849 the series of eight track charts covering the whole of the North Atlantic and a portion of the South Atlantic was completed.

The other series of Wind and Current Charts were issued from time to time, as they were successively completed, and their scope was gradually extended to include every navigable sea. In addition eight editions of Sailing Directions were issued in ten volumes. These contained information upon a vast number of subjects connected with the navigation of the ocean.

In commendation of this work, the Secretary of the Navy, in his annual report dated November 29, 1851, said: "The wind and current charts planned by Lieutenant Maury are being extended to the Pacific and Indian oceans. . . . This work has materially shortened the passage along the highways by which our commerce passes into and through the southern hemisphere."

During the period, 1844 to 1861, there were issued and gratuitously furnished to merchant vessels alone, twenty thousand copies of Sailing Directions and two hundred thousand copies of Wind and Current Charts. There were engraved and published, forty-four general sailing charts, all from surveys of the North Pacific Surveying Expedition under Commander John Rodgers, and plans of anchorages and passages in the Lu Chu (Ryu Kyu) groups, from surveys of the Exploring Expedition under Commodore Matthew C. Perry.

At the same time meteorological and magnetic observations were made at the Depot, and the other functions of observing the errors and rates of chronometers and examining, purchasing, and issuing charts, instruments, and nautical books to vessels of the Navy, were looked after.

From 1852 to 1854, Commodore Perry conducted an expedition to Japan, which, though of a diplomatic nature undertaken for the purpose of opening ports for trade with the United States, made surveys and other observations and collected much nauti-

cal and scientific information. A narrative of this expedition was published in three volumes.²²

From 1853 to 1859, an expedition originally under the command of Commodore Cadwalader Ringgold, but later under Lieutenant John Rodgers, surveyed the North Pacific Ocean. This expedition was authorized, August 31, 1852 (10 Stat. L., 100, 104), and \$125,000 was appropriated for the purpose. As a result of its work, the government was enabled to publish detailed coasting charts of the entire coast of Japan, the coasts and islands of the Bering Sea, and of a portion of the Arctic Ocean. Elaborate scientific studies were made on this expedition, but the results were not published.

Commander Maury devoted much of his attention, in addition to the other hydrographic and the astronomic work, to the physical geography of the oceans. The characteristic investigations of the Depot, instituted by him dealt with: "The form and divisions of the marine areas of the globe, with the winds that blow over the surface waters and their agency in minimizing the duration of the passages of ships, the contours of the ocean bed from the sea level down to the greatest depths, the temperature, the circulation, the physical and chemical properties of sea water, the currents, tides, waves, the composition and distribution of marine deposits, the nature and distribution of marine organisms and the modifications brought about in living things by the conditions of their existence, the relation of man to the ocean in the development of fisheries, commerce, civilization, navigation, hydrography, and marine meteorology."²³

The researches made by the Depot of Charts and Instruments for the benefit of navigation and commerce were early brought to the attention of other governments, and as a result, an international conference, proposed by Maury, was held at Brussels, Belgium, in August and September, 1853, for the purpose of securing a uniform system of observations at sea. A form of abstract log and a plan of observations at sea, recommended at this conference, were adopted by nearly all the maritime nations through their navies and the voluntary coöperation of their merchantmen.

²² Perry, United States Japan expedition (1856).

²³ Origin and mission of the Hydrographic Office, p. 3 (1918).

Commander Maury, like other meteorologists of the period, was strongly in favor of a system of reporting daily weather conditions on land by means of the telegraph, as is now being done by the Weather Bureau, and he advocated it in several of his publications.

Commander Maury joined the confederate forces in 1861, and was replaced by Commander Gilliss, his predecessor in charge of the Depot.

During the Civil War period, the hydrographic work of the Depot (Naval Observatory) was largely concentrated upon the purchase, care, and distribution of charts, compasses, spy-glasses, chronometers, and other navigating instruments, to nearly six hundred active cruising vessels engaged in the war. While as much of the hydrographic work as possible was maintained, the soliciting of meteorological data from merchant vessels for use in the preparation of charts was temporarily discontinued. During this period the Depot published charts of the Compass Stations at New York, Boston, Hampton Roads, the Delaware River, and Portsmouth, N. H.

An elaborate report, accompanied by maps and profiles, was made by the Depot, in response to a Senate resolution of March 19, 1866,* calling upon the Secretary of the Navy to furnish "the summit levels and distances by survey of the various proposed lines for interoceanic canals and railroads between the Atlantic and Pacific oceans, as also their relative merits as practical lines for the construction of a ship canal, and especially as relates to the Honduras, Tehuantepec, Nicaragua, Panama, and Atrato lines."

Astronomical Work of the Depot of Charts and Instruments. Observations of the sun, moon, planets, and brighter stars were begun in January, 1845, and these objects have been continuously observed since that time. The results of the observations made in the year 1845 were published in September, 1846. This publication was characterized as the first volume of astronomical observations "ever issued from an institution properly entitled to the name of an observatory on this side of the Atlantic." "

* Naval Observatory, Report on interoceanic canals and railroads between the Atlantic and Pacific oceans. 39 Cong. 1 sess., S. ex. doc. 62.

" Letter of Lieutenant Maury, Superintendent of the Depot, to the Secretary of the Navy.

In addition to this regular work of the Observatory, there was taken a series of zone observations of fainter stars, in accordance with the second paragraph of the order issued on March 6, 1846, by the Secretary of the Navy to the Superintendent of the Depot of Charts and Instruments. The order read:

Desirous that the numerous and able corps employed at the National Observatory at Washington may produce results important to maritime science and to the Navy, I approve your course in making the series of astronomical observations necessary for the preparation of a nautical almanac.

The country expects also that the observatory will make adequate contributions to astronomical science. The most celebrated European catalogue of the stars, Bessel's Zone Observations and Struve's Dorpat Catalogue of double stars, having extended to only 15° south of the equator, and the Washington Observatory by its geographical position commanding a zone of 15° farther south, and being provided with all instruments requisite for extending these catalogues, you are hereby authorized and directed to enter upon the observation of the heavens, commencing at the lowest parallel of south declination you may find practicable. You will embrace in your catalogue all stars, even of the smallest magnitude, which your instruments can accurately observe. You will, when convenient, make duplicate observations of stars for each catalogue, and when time permits, you will determine with precision, by the meridian instruments, the position of the principal stars in each pair or multiple of stars. Simultaneously with these observations you will, as far as practicable, determine the position of such stars as have different declinations or right ascensions assigned to them in the most accredited ephemerides.

The observations for making this catalogue of stars were begun on March 21, 1846, with three meridian instruments, the mural circle, the meridian circle, and the transit instrument, and were discontinued in the year 1852. The zones made with the meridian circle in 1846 were published in 1860. Most of the remaining zones made in 1846 to 1849 were published in three appendices to the Washington Observations, 1869, 1870, and 1871. The remaining zones were never published as such, but were included with the published ones in the formation of a general catalogue which appeared in 1911 as Volume VII, Publications of the U. S. Naval Observatory, Second Series.

In referring to these observations in his annual report for 1846, the Secretary of the Navy said that with the facilities of the observatory we might produce our own nautical ephemeris, a small appropriation being sufficient to accomplish the object, the expenditure for which would be returned by supplying our merchant vessels with nautical almanacs at cost.

The Naval Observatory was brought into considerable prominence among astronomers throughout the world in 1847, through the discovery by one of the astronomers of the observatory staff, Sears C. Walker (February 1, 1847), that the planet Neptune, which had been discovered September 23, 1846, was identical with a star seen twice by Lalande in May, 1795, and which had since been listed as a fixed star No. 26266, in Lalande's catalogue. The researches which resulted in this discovery afforded the means of accurately determining the orbit of Neptune.

On August 3, 1848 (9 Stat. L., 266, 267), an appropriation of \$5000 was made by Congress to be expended by the Secretary of the Navy for observations which had been recommended to him by the American Philosophical Society and the Academy of Arts and Sciences. As a result of this appropriation, an astronomical expedition in Chile, was carried on during the years 1849 to 1852, under the supervision of Lieutenant Gilliss. The results, which were published in 1854,²³ relate to Chile, its geography, climate, earthquakes, government, social condition, mineral and agricultural resources, and commerce; the solar parallax, magnetical and meteorological observations, etc.

In 1849 the first practical chronograph (Dr. John Locke's "magnetic" clock) in which electricity was first employed in the recording of observations, was installed at the observatory.

In 1854 and 1855, important astronomical observations were made by Lieutenant John M. Brooke, in connection with the Rodgers North Pacific Exploring Expedition.²⁴

Between 1854 and 1860 three minor planets were discovered at the Naval Observatory.

When Captain Gilliss succeeded Commander Maury in 1861, he continued the astronomical observations and took steps to reduce and publish the observations that had been made under the

²³ 33 Cong. 1 sess., H. ex. doc. 121.

²⁴ See page 19.

direction of his predecessor, and to have subsequent astronomical and meteorological observations published in annual volumes. Captain Gilliss died in office, February 9, 1865. With his death there passed from the Hydrographical Office and Naval Observatory the last of the four eminent scientists who had laid the foundations for these institutions; namely, Goldsborough, Wilkes, Maury, and Gilliss.

As the optical power of the telescopes at the Observatory was too low to enable the astronomers to meet the demands of the time, a new meridian circle was obtained from Pistor and Martins in Germany and was mounted on October 28, 1865. Commenting upon this new instrument, the Superintendent of the Depot said:

The employment of this instrument in the Naval Observatory constitutes a new era in its progress and restores it to the rank of a first-class institution. The old instruments of this establishment were fully, both in size and style of their construction, up to the standard of the day in which they were ordered. But new and important advances have since been achieved in the art of making astronomical instruments, in size as well as in precision; and we find ourselves now in possession of a meridian circle with which we can measure right ascensions and polar distances at the same moment and with equal exactness.

A regular course of observations with the new instrument was begun January 1, 1866.

The astronomical and meteorological observations made during 1863 and 1864 were published during the years 1865 and 1866. An appendix to the volume of observations for 1864 discusses the latitude and longitude of the observatory. In the volume of observations of 1866 a full discussion is given of the meteorological observations made by the observatory for the period June 30, 1842, to January 1, 1867.

Legal Status of the Depot of Charts and Instruments. The Depot of Charts and Instruments, commonly designated the Naval Observatory, had its origin in an order of the Secretary of the Navy dated December 6, 1830. It was then placed under the administrative control of the Board of Navy Commissioners, where it remained until 1842. On August 31, 1842, an act (5

Stat. L., 579) was approved which reorganized the Navy Department and abolished the Board of Navy Commissioners; and the Secretary of the Navy by order of November 26, 1842, placed the institution under the jurisdiction of the newly-created Bureau of Ordnance and Hydrography, as its hydrographic branch. Another reorganization act of July 5, 1862 (12 Stat. L., 510), replaced the Bureau of Ordnance and Hydrography, by the Bureau of Ordnance and created a new Bureau of Navigation. By order of the Secretary of the Navy, the Depot was transferred to the latter bureau on August 31, 1862, where it remained until it was replaced by the Hydrographic Office and the United States Naval Observatory August 1, 1866.

Various names have been used in legislative enactments and in official documents and correspondence to designate this institution. In official documents, the earliest mention of it was made in the executive order providing for the establishment in 1830 of a "Depot of Charts and Instruments," also designated "Depot for Charts and Instruments." These designations, however, soon became obsolete. Some letter heads used in official correspondence in October, 1844, bore the name "U. S. Naval Observatory," the earliest of such letters being dated October 12, 1844. Other letter heads used about the same time bore the name "Hydrographical Office," and still others, the name "Depot of Charts." In Volume I of Astronomical Observations for 1845, published in 1846, this institution for the first time bears the name "United States Naval Observatory," by order of the Secretary of the Navy. In December, 1854, the Secretary of the Navy directed that this institution be styled "United States Naval Observatory and Hydrographical Office," and the depot was so designated in the Navy Department until September 1, 1866, when the hydrographic work was separated from the Naval Observatory in accordance with the act approved June 21, 1866 (14 Stat. L., 69).

Originally known as the Depot for Charts and Instruments, the first and only legislative act designating it by that name was that of August 31, 1842 (5 Stat. L., 576), which authorized "the construction of a depot for charts and instruments of the Navy of the United States." The annual appropriation acts in which this institution was specifically mentioned, designated it

variously as "Hydrographical Office," "Observatory," "National Observatory," "Naval Observatory," "Hydrographical Office and National Observatory," "Hydrographical Office and United States Observatory," "Observatory and Hydrographical Office," "United States Naval Observatory and Hydrographical Office," and "United States Observatory and Hydrographical Office." Sometimes one, sometimes two, and sometimes three of these designations were used in the same act.

The first time that the designation "Naval Observatory" was used in a legislative measure was in a paragraph of an act of August 3, 1848 (9 Stat. L., 266), making appropriation "for the pay of the Superintendent of the Naval Observatory at Washington City" and construing an item of the act of March 3, 1847 (9 Stat. L., 169), relating to the pay of the Superintendent, "to apply to the Superintendent of said Naval Observatory." The term "United States Naval Observatory," in a legislative act, was first used in an appropriation act of August 16, 1856 (11 Stat. L., 44, 47), which made provision for the "United States Naval Observatory and Hydrographical Office."

The original functions of the Depot of Charts and Instruments were to collect, verify, and correct nautical charts, books, and instruments for the use of the Navy. The original hydrographic surveys and astronomical, meteorological, and magnetic observations, were later developments.

When Congress first specifically recognized the Depot, it made no mention of its hydrographical or astronomic functions. While hydrographic surveys and exploring expeditions by the Navy Department, requiring also astronomic observations, were authorized and directed by law on several occasions prior to 1842, this Depot was not mentioned in such acts.

An act of August 3, 1848 (9 Stat. L., 268, 272), made provision "for 'meteorological observations' to be conducted under the direction of the Secretary of the Navy"; also for professors of mathematics to "perform such duties as may be assigned them by order of the Secretary of the Navy" at the "Observatory," among certain other institutions. Specific appropriations for meteorological observations were continued each year until 1859. Such observations, however, were continued after that time without specific appropriations.

Specific appropriations for "Wind and current charts" were first made in the act of August 31, 1851 (10 Stat. L., 100, 101). These appropriations were continued for each year through 1860.

Appropriations were made as follows during that period for exploring expeditions by the Navy Department, involving hydrographic, astronomic, and meteorological work: The Wilkes Exploring Expedition, to survey and explore the Pacific Ocean and the South Seas, authorized by the act of May 14, 1836 (5 Stat. L., 27, 29), which was carried on from 1838 to 1842; the Gilliss Chilean Expedition of 1848 to 1852; the Rodgers North Pacific and Arctic Surveying Expedition of 1853 to 1855; the Paraguay Expedition of 1853 to 1856; and Commodore Perry's expedition to Japan of 1852 to 1853. Subsequent appropriations were made at different times for the publication and distribution of results of these explorations and surveys.

An act approved February 21, 1861 (12 Stat. L., 147, 150), provided that "all appropriations made for the preparation or publication of foreign hydrographic surveys, shall only be applicable to their object upon the approval of the Secretary of the Navy, after a report from three competent naval officers, to the effect that the original data for the proposed charts are such as to justify their publication." It also directed the Secretary of the Navy to appoint such a board. This provision was re-enacted January 12, 1895 (28 Stat. L., 601, 621), as Section 78 of "an act providing for the public printing and binding and the distribution of public documents."

The Hydrographic Office, 1866 to 1926. In 1866 there were included in one organization, a depot of charts and instruments, a hydrographic office, and an astronomical, a meteorological, and a magnetic observatory, all under one superintendent, who in that year, by resolution of the Senate, was also required to make a report on interoceanic canals and railroads. As the functions of these institutions were regarded as too diverse for one organization, a separation was made in that year.

An act of Congress, approved June 21, 1866 (14 Stat. L., 69), entitled "An act to establish a Hydrographic Office in the Navy Department," defines the functions of that office, and constitutes its organic act as it exists to-day. It virtually separated that Office from the United States Observatory, although the latter is not

mentioned in the act. The separation actually took place August 1, 1866, when Commander T. S. Fillebrown was detached from the Naval Observatory, where he had charge of the preparation of charts, etc., and was appointed Hydrographer of the newly created Hydrographic Office.

Organization and Administration. The act of June 21, 1866, provided as follows:

That there shall be a hydrographic office attached to the bureau of navigation in the Navy Department, for the improvement of the means for navigating safely the vessels of the navy and of the mercantile marine, by providing, under the authority of the Secretary of the Navy, accurate and cheap nautical charts, sailing directions, navigators, and manuals of instructions, for the use of all vessels of the United States, and for the benefit and use of navigators generally.

SEC. 2. That the Secretary of the Navy be, and he is hereby, authorized to cause to be prepared, at the hydrographic office attached to the bureau of navigation in the Navy Department, maps, charts, and nautical books relating to and required in navigation, and to publish and furnish them to navigators at the cost of printing and paper, and to purchase the plates and copyrights of such existing maps, charts, navigators, sailing directions and instructions as he may consider necessary, and when he may deem it expedient to do so, and under such rules, regulations, and instructions as he may prescribe.

SEC. 3. That the moneys which may be received from the sale of all such maps, charts, and nautical books shall be returned by the Secretary of the Navy into the treasury of the United States, to be used in the further preparation and publication of maps, charts, navigators, sailing directions and instructions for the use of seamen, and to be sold at the rates as set forth in the preceding section.

Upon the enactment of this law, that part of the Depot of Charts and Instruments which constituted the Hydrographic Office was separated from the Naval Observatory, and the Office with its charts, books, and instruments, except the chronometers, was moved into rented quarters in what is known as the "Octagon House" at Eighteenth Street and New York Avenue, Northwest. The original personnel of the newly created Hydrographic Office consisted of a commander, two lieutenant commanders, one lieutenant, two ensigns, a professor of mathematics, and seven civilians.

On January 21, 1871, a plan for the reorganization of the Hydrographic Office was presented by the Chief of the Bureau of Navigation and approved by the Secretary of the Navy. This plan created the title "Hydrographer to the Bureau of Navigation" for the officer in charge, and defined his duties. It divided the Office into five sections, as follows: No. 1, department of archives; No. 2, chart department; No. 3, meteorological department; No. 4, drafting and engraving department; No. 5, instrument department; and a library. The functions of each of these sections were defined in detail in the plan as approved and adopted.

Immediately upon its reorganization, the hydrographic work was vigorously carried forward, new charts and sailing directions were issued, and the purchased plates were corrected. This work, however, was greatly hampered at that time by the lack of adequate appropriations.

In the summer of 1879 the Hydrographic Office was removed from the "Octagon House" to the new building for the State, War, and Navy departments.

The Hydrographic Office was transferred from the Bureau of Navigation to the Bureau of Equipment by the act of May 4, 1898 (30 Stat. L., 369, 374). The acts of June 24, 1910 (36 Stat. L., 605, 613), March 4, 1911 (36 Stat. L., 1265, 1273), August 22, 1912 (37 Stat. L., 328, 339), and March 4, 1913 (37 Stat. L., 891, 899), directed the distribution of the duties of the Bureau of Equipment among other bureaus and offices of the Navy Department, and an act of June 30, 1914 (38 Stat. L., 392, 408), provided for its abolition. Under the first of these acts the Hydrographic Office was transferred to the Bureau of Navigation on July 1, 1910, by order of the Secretary of the Navy.

Nautical Charts. In accordance with Section 2 of the organic act, steps were taken immediately upon the organization of the new Hydrographic Office "to purchase the plates and copyrights of such existing charts, maps, sailing directions," etc., as were needed and could be obtained. There was at that time but one firm in this country which had undertaken the publication of nautical charts and hydrographic information on anything like an adequate scale. This firm proposed to sell to the government such charts, maps, nautical books, and chart plates in its possession as it needed, and after consideration by a board of experts appointed by the Navy

Department, a price was agreed upon and the purchase was made. Additional plates were purchased from the same firm a few years later.

These purchases included twenty-four copper plate charts relating mainly to the coasts of America, the copyrights of Bowditch's *American Practical Navigator*, and a few volumes of coast pilots and sailing directions.

At the time of these purchases the Navy Department possessed the engraved plates of the surveys made by the Wilkes Exploring Expedition in 1838 to 1842 and the Rodgers North Pacific and Arctic Surveying Expedition in 1853 to 1855, and some plates of surveys made by Perry's Expedition to Japan in 1852 to 1853. The purchased plates, charts, etc., together with those already in its possession, formed the nucleus of the present collection of the Hydrographic Office.

All these charts, plates, and nautical publications had to be examined, corrected, and systematically classified and arranged by the Hydrographic Office. In addition to this work, the Office, during its first year, began the publication of charts of surveys and other nautical information.

In 1867 the Office began the publication of the series of "Hydrographic Notices," and in 1869, the series of weekly "Notices to Mariners." These two publications were subsequently consolidated under the name of the latter and have been continued to the present day.

A transfer of photolithographic charts to copperplate was authorized by an act of August 5, 1882 (22 Stat. L., 288), and the work of engraving was immediately begun.

In December, 1883, the Hydrographic Office began the publication of the Pilot Chart of the North Atlantic Ocean, and in January, 1894, the Pilot Chart of the North Pacific Ocean. These charts are founded upon Maury's "Wind and Current Charts," issued between 1844 and 1861. They show, geographically, such navigational features as magnetic variations, currents, sail and steamship tracks, meteorological conditions, floating dangers, storm warning signals and stations, and other matters affecting the speed and safety of navigation. The charts are monthly publications, and are now being issued for all oceans.

The issue of notices to mariners and other urgent nautical information was greatly facilitated by the acquisition by the Hydro-

graphic Office, in March, 1885, of a cylinder printing-press. This enabled the Office to publish this information at the branch of the Government Printing Office located in the Navy Department, and thereby avoid the delays due to publication at the central Government Printing Office. Since the abolition of the Navy Department branch of the Government Printing Office in 1915, the Notices to Mariners have reverted to the central Government Printing Office.

The preparation of gnomonic charts covering the great oceans was begun in 1885, these charts affording facilities for finding the Great Circle course and the distance between any two points.

Surveys and Explorations. Surveys of a number of islands lying in or near the route between San Francisco and Australia were undertaken in 1872, as a result of an appropriation of \$50,000 "for surveying in the Pacific" made on May 23, 1872 (17 Stat. L., 145, 146), but as Congress failed to renew the appropriation, this work had to be abandoned. The results of the surveys made were published.

An expedition to establish, by means of telegraphy, the longitude of certain points in the West Indies and on the northeast coast of South America, points where the submarine cable had been landed, was undertaken in November, 1874. Similar observations at other points were undertaken during the ten-year period following, by means of which the longitude of thirty places forming a girdle around the entire globe was telegraphically determined.

Surveys were made of the Amazon and Madeira rivers and their approaches and of the Pacific coast of Mexico, as the result of an appropriation of \$23,000 made by Congress in an act of May 3, 1880 (21 Stat. L., 82, 84). An additional appropriation of \$14,000 was made in the act of August 3, 1882 (22 Stat. L., 284, 288), for completing the survey of the west coast of Mexico and extending it to the Gulf of Dulce.

In addition to surveys made by regular surveying vessels, it early became the policy of the Navy Department to encourage its naval officers, while on their cruises, to make special surveys and explorations at every opportunity, a policy which is still being maintained.

An appropriation act of September 7, 1888 (25 Stat. L., 458, 459), contained for the first time an appropriation "For special ocean surveys, and the publication thereof" during the fiscal year ending June 30, 1889. An act of June 30, 1890 (26 Stat. L., 189,

190), made an appropriation for "Ocean and lake surveys, the publication and care of the results, thereof." This item of appropriation for ocean and lake surveys has been repeated each year to the present time. While the funds thus appropriated have been expended for work done by the Hydrographic Office, the appropriation was made each year for the Bureau to which the Hydrographic Office was attached.

An act of June 4, 1897 (30 Stat. L., 11, 48), made an appropriation under the head of War Department, Engineering Department, "For expense of necessary survey of entrance to and of Pearl Harbor, Hawaiian Islands, and to enable the Secretary of the Navy to ascertain and report to Congress the amount of land necessary to be acquired in said harbor and the probable cost thereof for a coaling and repair station." A subsequent act of March 15, 1898 (30 Stat. L., 277, 302), made an appropriation under the head of Navy Department, Hydrographic Office, "For drawing and engraving on copperplates the survey of Pearl Harbor, Hawaiian Islands, authorized under the sundry civil act of June 4, 1897," etc. At that time the Hawaiian Islands were an independent republic.

An act of June 6, 1900 (31 Stat. L., 578, 588), provided for the appointment of two naval officers by the Secretary of the Navy and one engineer officer by the Secretary of War, to constitute a board "to make a survey, plan, and estimate for the improvement of a harbor at the island of Guam." The Hydrographic Office participated in carrying on this work.

The following United States Naval Surveys have been made since the establishment of the Hydrographic Office and its predecessor, the Depot of Charts and Instruments: *

Africa, four surveys, 1844, 1879, 1909
Alaska, fifty surveys, 1855, 1869, 1874, 1880, 1889, 1902 to 1905
Antarctic Continent and Ocean, one survey, 1840
Arctic Ocean and Bering Sea, ten surveys, 1855, 1881, 1889
Arctic Regions (North Atlantic), one survey, 1885
Bahamas, three surveys, 1859, 1886, 1902
Brazil, fifteen surveys, 1838, 1864, 1869, 1878, 1886, 1901, 1902
British Columbia, six surveys, 1883, 1890, 1900

* A detailed list showing each locality surveyed, with the year of the survey and the name of the vessel or expedition making the survey is published in the Annual Report of the Hydrographic Office for 1924, pp. 43-59. The list is also published under separate cover.

- California, Gulf of, thirty-eight surveys, 1866 to 1875, 1881, 1882,
 1887, 1896, 1897, 1901 to 1903, 1916
 Caroline Islands, two surveys, 1870, 1890
 China, eleven surveys, 1854, 1868, 1870, 1902, 1903, 1907, 1908
 China and Java Seas, one survey, 1854
 Chosen (Korea), six surveys, 1869, 1884, 1885, 1891
 Colombia, north coast, three surveys, 1871, 1884
 Colombia, west coast, one survey, 1873
 Costa Rica, east coast, two surveys, 1872, 1909, 1910
 Costa Rica, west coast, twenty surveys, 1860, 1880, 1885, 1886,
 1891
 Cuba, fifty-eight surveys, 1869, 1882, 1889, 1892, 1899, 1900, 1901
 to 1918, 1921 to 1926
 Ellice Islands, six surveys, 1839, 1841
 Fiji Islands, thirty-six surveys, 1840, 1855
 Gilbert Islands, thirteen surveys, 1841, 1872
 Great Lakes, seventeen surveys, 1889, 1892, 1894 to 1897, 1901
 Guam, four surveys, 1899, 1901, 1915 to 1917
 Guatemala, east coast, three surveys, 1896, 1909
 Guatemala, west coast, two surveys, 1899
 Gulf Coast, one survey, 1912
 Island of Haiti, sixty-nine surveys, 1871, 1882, 1900 to 1917, 1924
 Hawaiian Islands, thirty-six surveys, 1840, 1841, 1856, 1859, 1867,
 1868, 1870, 1873 to 1875, 1887, 1897, 1900 to 1906, 1914
 Honduras, east coast, four surveys, 1853, 1896, 1909, 1924
 Honduras, west coast, seven surveys, 1857, 1884, 1918, 1924
 Jamaica, two surveys, 1877, 1904
 Japan, seventeen surveys, 1854, 1855, 1859, 1880, 1881
 Marshall Islands, four surveys, 1841, 1872
 Mediterranean Sea, four surveys, 1879, 1896
 Mexico, east coast, ten surveys, 1847, 1870, 1871, 1873, 1874, 1885,
 1896, 1914 to 1916, 1920
 Mexico, west coast, eighty-five surveys, 1873 to 1875, 1878, 1879,
 1882, 1885 to 1907, 1915, 1916
 Nansei Islands, thirty-two surveys, 1853 to 1855, 1859, 1867, 1870,
 1877
 Nicaragua, east coast, eight surveys, 1872, 1873, 1890, 1895, 1899,
 1910 to 1914, 1915 to 1917, 1921, 1922
 Nicaragua, west coast, eight surveys, 1883, 1884, 1898, 1905, 1915,
 1916, 1917, 1918
 North Pacific isolated islands, ten surveys, 1840, 1841, 1856, 1872,
 1874
 Nova Scotia, one survey, 1876
 Panama, north and east coasts, twenty-one surveys, 1870, 1875,
 1901 to 1910, 1913 to 1922, 1924
 Panama, south and west coasts, six surveys, 1871, 1900, 1902,
 1917-22, 1924

- Peru, two surveys, 1872, 1884
 Philippine Islands, twenty-five surveys, 1841, 1901 to 1904, 1909
 Phoenix Group, seven surveys, 1840, 1872
 Porto Rico, two surveys, 1902, 1916
 Salvador, eight surveys, 1857, 1880, 1884, 1885, 1898, 1904, 1908
 Samoa Islands, thirty-six surveys, 1839, 1841, 1872, 1888, 1889,
 1900 to 1922
 Siam, Gulf of, one survey, 1893
 Siberia, twelve surveys, 1855, 1865, 1902
 Society Group, three surveys, 1839
 Tierra Del Fuego, three surveys, 1839
 Tonga or Friendly Islands, one survey, 1841
 Tuamotu Archipelago, twenty-five surveys, 1839, 1840, 1841, 1886,
 1899
 Union Group, three surveys, 1841
 United States, east coast, six surveys, 1837, 1888, 1900, 1901, 1907
 United States, west coast, thirty-one surveys, 1841, and five sur-
 veys, 1901 to 1904, 1922
 Uruguay and Argentina, eleven surveys, 1855, 1874, 1876, 1902
 Venezuela, thirteen surveys, 1877, 1888, 1892, 1899 to 1901, 1924
 to 1926
 West Indies, three surveys, 1902, 1903, 1905

Meteorological and Magnetic Observations. The soliciting of meteorological data from merchant vessels for use in the construction of charts, which had been suspended at the outbreak of the Civil War, was resumed in 1873, and the data obtained were used in a new edition of Maury's charts. The preparation of a series of meteorological charts of the North Pacific Ocean was begun in September, 1875, and completed the following year. A similar work was undertaken for the North Atlantic Ocean in October, 1877. These charts gave for each month of the year data concerning the "winds, calms, fogs, rain, squalls, weather, barometer, and temperature of the air and of the sea water at the surface."

A compilation of the results of magnetic and meteorological observations made in foreign countries, and of shipwrecks, dangers to navigation, changes in channels, lighthouses, buoys, beacons, and other facts of interest to navigation, was undertaken in 1882 by the Hydrographic Office in coöperation with the State Department. The information was obtained through the State Department from the United States consular officers in foreign countries by means of circulars prepared by the Hydrographic Office, and was collected at the latter.

The collection of data for the preparation of magnetic variation charts was begun in 1885, the Hydrographic Office having previously depended wholly upon such information issued by the British Admiralty.

The Navy Department had been obtaining weather reports from mariners almost continuously since 1844. When the Weather Bureau was organized as a branch of the Signal Service of the Army in 1870 it duplicated in a measure this work of the Depot of Charts and Instruments²¹ until 1887, when all the marine meteorological work of that Bureau was transferred to the Hydrographic Office of the Navy Department. Later on, however, the Weather Bureau, then in the Department of Agriculture, resumed the work of receiving and publishing meteorological reports from vessels in duplication of the work of the Hydrographic Office.

On June 24, 1904, the President appointed an interdepartmental board, consisting of representatives of the Departments of War, Navy, Agriculture, and Commerce and Labor to consider the questions of wireless telegraphy and of duplication of meteorological work. On July 12, 1904, the board made its report, which was approved by the President on July 29, 1904, the President directing that the several departments concerned put its recommendations into effect.

The recommendations that concern the Hydrographic Office and its work were as follows:

That the Weather Bureau of the Department of Agriculture furnish to the Hydrographic Office of the Navy, and to the Naval wireless telegraph stations, . . . such meteorological data as it or they may desire at no cost to them;

That the Department of Agriculture shall continue the work of its meteorological vessel-reporting and storm-warning stations, as now constituted and provided for by law . . . ;

That all meteorological reports from vessels of war or commerce or other sailing craft, now being forwarded direct to the Hydrographic Office of the Navy, shall be forwarded direct to the Weather Bureau, and the control of ocean meteorology be transferred to the Department of Agriculture . . . ;

That the estimates for the support of the Hydrographic Office of the Navy, or any other office of the Navy, for the next succeed-

²¹ See Institute for Government Research, Service Monograph No. 9, pp. 10, 11.

ing fiscal years do not contain any provision for the making of ocean forecasts, or for the publication of meteorological data, other than such as may be needed by the hydrographer of the Navy for use on the pilot and other charts, which data shall be furnished by and credited to the Weather Bureau ;

That it is the opinion of this board that no meteorological work need or should be done by any portion of the Navy for the purpose of publication, or for the making of forecasts or storm warnings

... ;
That the wireless stations of the Navy Department shall, without charge to the Agriculture Department, receive and promptly transmit to the ocean or to islands, or to other places where the information can be made useful, the storm warnings of the Weather Bureau ;

That the Navy Department shall request all vessels having the use of its wireless stations for the receipt of messages to take daily meteorological observations of the weather when within communicating range and to transmit such observations to the Weather Bureau, through naval wireless stations at least once daily, and transmit observations oftener when there is a marked change in the barometer and that there shall be no charge against the Agriculture Department for these observations, or for the transmission thereof.

As a result of the President's approval of these recommendations, the marine meteorological work of the Hydrographic Office was transferred to the Weather Bureau on December 1, 1904, and the meteorological data published by the Hydrographic Office in the Pilot Charts have been supplied since that time by the Weather Bureau.

An approval of this arrangement with regard to the Pilot Charts is expressed in a provision of an act of June 17, 1910 (36 Stat. L., 468, 508), which directs that

Hereafter the pilot charts prepared in the Hydrographic Office shall have conspicuously printed thereon the following: " Prepared from data furnished by the Hydrographic Office of the Navy Department and by the Weather Bureau of the Department of Agriculture, and published at the Hydrographic Office, under the authority of the Secretary of the Navy "; and all meteorological information received by the Weather Bureau of the Department of Agriculture necessary for and of the character of such information heretofore used in the preparation of the pilot charts shall continue to be furnished with all possible expedition to the Hydrographic Office for use in the preparation of said charts.

Notwithstanding the adoption of the above recommendations and compliance with the above-mentioned provision of law, there continued to be a certain measure of duplication of work on the part of these two services in the publication of ocean meteorological data. This duplication was finally eliminated in 1913, by formal agreement between the Navy Department and the Department of Agriculture relative to the work of the Hydrographic Office and the Weather Bureau:

- (a) That the Weather Bureau discontinue the ocean and lake meteorological charts
- (b) That the Hydrographic Office continue the publication of the Pilot Charts
- (c) That the Weather Bureau continue the control of ocean meteorology so far as concerns the collection of meteorological observations and their compilation and the use of such observations in research work
- (d) That the Hydrographic Office continue the distribution of the Pilot Charts at its main office and branch offices; and that it furnish all marine observers taking observations for the Weather Bureau, and all regular Weather Bureau coast stations, necessary copies of the issues of the several Pilot Charts
- (e) That the Weather Bureau furnish all meteorological data necessary to the preparation of the Pilot Charts, and in such forms as may be mutually agreed upon between the two offices, in accordance with the existing law
- (f) That the Hydrographic Office give the Weather Bureau due credit on the Pilot Chart for the data thus published as required by law.²²

Dissemination of Navigational Information. Increased facilities for the dissemination of navigational information by the Hydrographic Office were inaugurated in 1884 through the establishment of branch offices at Boston, New York, Philadelphia, Baltimore, New Orleans, and San Francisco, the appropriation act of July 7, 1884 (23 Stat. L., 159, 184), making special provision for the first time for these offices. The number of offices has been increased from time to time.

It has been the policy of the Hydrographic Office from the beginning to locate the branch offices, whenever practicable, in buildings occupied by the maritime exchanges. At these offices, shipmasters and others interested in navigation may have their

²² Navy Department File 24501-31, August 14, 1913.

charts compared and corrected, secure more readily the latest publications of the Hydrographic Office, and obtain information upon nautical subjects. The establishment of the branch offices immediately resulted in a more prompt and certain delivery of "Notices to Mariners" to those concerned, thus enhancing their value and increasing the demand for them.

The Hydrographic Office also established, about this time, a system of mutually exchanging publications with those of similar offices in other countries, thus greatly extending the field over which the hydrographic information was given.

Ice Patrol. On May 15, 1912, about a month after the "Titanic" disaster a recommendation for an ice patrol in the vicinity of the steamer lanes was made by the Hydrographic Office to the Navy Department, and a few days later two vessels of the Navy were detailed for this service. These vessels kept steamers constantly informed by radio of the ice conditions near the steamer lanes. They also gave valuable information concerning the visibility, drift, and behavior of ice. Observations were made and valuable data were secured by representatives of the Hydrographic Office and of the Bureau of Standards during the patrol.

Circumstances having prevented the Navy Department from carrying on the ice patrol the following year, the Treasury Department undertook the patrol with vessels of the Revenue-Cutter Service (now the Coast Guard), which coöperated with the Hydrographic Office in the gathering and disseminating of information concerning ice, and their cruising reports were published in the bulletins of the Hydrographic Office. The Hydrographic Office, at this time, also made arrangements with the British Board of Trade to receive and disseminate in this country ice reports from a scout ship which that Board had sent out for ice work.

International Hydrographic Conferences. On June 28, 1912, a joint resolution (37 Stat. L., 637) was adopted by Congress, proposing an international maritime conference to be called either by the United States or by some other nation, and authorizing the President to appoint Commissioners to represent the United States at such a conference. The purpose of this conference, as outlined in the resolution, was:

to consider uniform laws and regulations for the greater security of life and property on merchant vessels at sea, including, if

practicable, regulations to establish standards of efficiency of the officers and crews of merchant vessels and the manning of such vessels; regulations for the construction and inspection of hulls, boilers, and machinery; regulations for equipment of ocean steamers with radio apparatus, searchlights, submarine bells, life-boats, and other life-saving and fire-extinguishing appliances; regulations concerning lights, sound signals, steering and sailing rules; regulations for an international system of reporting and disseminating information relating to aids and perils to navigation; the establishment of land routes to be followed by transatlantic steamers; and such other matters relating to the security of life and property at sea as may be proposed.

Largely as a result of this resolution, a conference on Safety of Life at Sea was held from November 12, 1913, to January 20, 1914, in London, at the call of the British Government. Ninety-six delegates and technical advisers and eighteen secretaries, representing the fourteen principal maritime nations and three British dominions, participated. The United States was represented by eleven delegates, including the Hydrographer.

At this conference articles and regulations were drawn up for adoption by the various countries, having for their object the establishment of international standards for securing safety of life at sea. The convention was signed at London, January 20, 1914, and the Senate of the United States consented to the ratification of the convention on December 16, 1914, with reservations, but up to the present time ratifications have not been exchanged by the participating governments.

As the result of an International Hydrographic Conference in London in July, 1919, which was attended by representatives of the Hydrographic Office and the Coast and Geodetic Survey and by representatives from twenty-four other governments, the International Hydrographic Bureau was established at Monaco. The objects of this office are:

- To establish a close and permanent association between the Hydrographic Services of the members
- To coördinate the hydrographic work of these Services with a view to rendering navigation easier and safer in all the seas of the world
- To cause the Hydrographic Offices to adopt the Resolutions made by the International Hydrographic Conference
- To endeavor to obtain uniformity as far as possible in hydrographic documents

To encourage the adoption of the best methods of carrying out hydrographic surveys
To advance the theory and practice of the science of hydrography.

Adherence to the International Hydrographic Bureau was announced by the State Department in May, 1921. On July 5, 1921, the directing board of the International Hydrographic Bureau arrived in Monaco, and the first full meeting of the board was held on July 25. On October 5, 1921, the bureau was placed in the League of Nations. On March 1, 1923, a draft of the revised statutes of the International Hydrographic Bureau was accepted by the United States, except the provision concerning the League of Nations.

Each of the twenty-five participating nations pays its pro rata share of the expenses of maintenance of the bureau. The first appropriation by Congress as the quota of the United States, for the maintenance of the International Hydrographic Bureau, \$2500, was made in the diplomatic and consular service appropriation act of March 2, 1921 (41 Stat. L., 1205, 1215). Annual appropriations of \$3860 have since been made for that purpose, the payments being made by the Department of State.

World War Activities. The entry of the United States in the World War in 1917 resulted in an extraordinary demand for the publications of the Hydrographic Office. Outfits of charts, books of sailing directions, and other nautical data, had to be supplied to a constantly increasing number of vessels of all types and tonnage; manuals of instruction in navigation were called for by various schools and colleges maintaining navigation classes, and by Reserve men and others aspiring to become officers in the Navy or in the merchant marine.

The surveying work had to be abandoned for a time, on account of war conditions, and vessels and crews diverted. The number of new charts had to be curtailed, because the demands made on the office force required concentration on quantity production from editions in hand, and war emergency reproduction of certain foreign charts which could not otherwise be procured. After the armistice the activities again became normal.

Executive Heads of the Depot of Charts and Instruments and the Hydrographic Office. Following is a list of officers in charge of the Depot of Charts and Instruments and of the Hydrographic

Office from the beginning of these institutions to the present time, with the date when each assumed office:

IN CHARGE OF DEPOT OF CHARTS AND INSTRUMENTS

Lieutenant L. M. Goldsborough.....	December 6, 1830
Lieutenant Charles Wilkes.....	March 12, 1883
Lieutenant James M. Gilliss.....	June 14, 1837
Lieutenant Matthew F. Maury.....	July 11, 1842
Captain James M. Gilliss.....	April 22, 1861
Rear Admiral Charles H. Davis.....	May 11, 1865

HYDROGRAPHERS

Commander Thomas S. Fillebrown.....	August 1, 1866
Captain Napoleon B. Harrison.....	July 28, 1868
Commander Edward Simpson.....	December 31, 1868
Commodore George F. Emmons.....	October 5, 1869
Captain Robert H. Wyman.....	October 1, 1870
Captain Samuel R. Franklin.....	May 17, 1878
Captain John C. P. de Krafft.....	July 14, 1880
Commander John R. Bartlett.....	June 30, 1883
Lieutenant George L. Dyer.....	June 1, 1888
Captain Henry F. Picking.....	November 20, 1889
Lieutenant Commander Richardson Clover.....	June 1, 1891
Commander Charles D. Sigsbee.....	May 31, 1893
Commander Joseph E. Craig.....	April 19, 1897
Commander Chapman C. Todd.....	January 22, 1900
Lieutenant Commander William H. H. Southerland...	November 4, 1901
Lieutenant Commander Harry M. Hodges.....	February 9, 1904
Commander Charles C. Rogers.....	October 29, 1906
Commander Albert G. Winterhalter.....	June 1, 1908
Commander John J. Knapp.....	January 12, 1910
Commander George F. Cooper.....	May 29, 1912
Commander Thomas Washington.....	April 20, 1914
Captain Thomas Snowden.....	June 21, 1916
Rear Admiral Seaton Schroeder (retired).....	October 30, 1917
Captain Edward Simpson.....	March 10, 1919
Rear Admiral Lloyd H. Chandler.....	June 23, 1920
Captain Louis R. de Steiguer.....	July 28, 1921
Captain Frederic B. Bassett.....	January 9, 1922
Captain W. S. Crosley (present incumbent).....	July 1, 1925

CHAPTER II

ACTIVITIES

The organic act of June 21, 1866, establishing the present Hydrographic Office provides that "There shall be a Hydrographic Office attached to the Bureau of Navigation in the Navy Department, for the improvement of the means for navigating safely the vessels of the Navy and of the mercantile marine, by providing, under the "authority of the Secretary of the Navy, accurate and cheap nautical charts, sailing directions, navigators, and manuals of instructions for the use of all vessels of the United States, and for the benefit and use of navigators generally," and "that the Secretary of the Navy be, and he is hereby, authorized to cause to be prepared, at the Hydrographic Office attached to the Bureau of Navigation in the Navy Department, maps, charts, and nautical books relating to and required in navigation, and to publish and furnish them to navigators at the cost of printing and paper, and to purchase the plates and copyrights of such existing maps, charts, navigators, sailing directions and instructions as he may consider necessary, and when he may deem it expedient to do so, and under such rules, regulations, and instructions as he may prescribe."

An annual appropriation is made for the Bureau of Navigation under the head of Ocean and Lake Surveys, "For hydrographic surveys, including the pay of the necessary hydrographic surveyors, cartographic draftsmen, and recorders, and for the purchase of nautical books, charts, and sailing directions." While the phrase "ocean and lake surveys" is used in the appropriations, the lake survey work is now a function of the Engineer Corps of the United States Army. The ocean survey work is performed under the immediate direction of the Hydrographic Office.

The following extracts from naval regulations and the Bureau of Navigation Manual further define the duties of the Bureau of Navigation, of the Hydrographic Office, and of naval officers with regard to hydrographic observations and reports.

NAVY REGULATIONS, 1920

443. (II) It [The Bureau of Navigation] shall be charged with the upkeep and operation of the Hydrographic Office . . . ; with all that relates to the supply of ships with navigational outfits, including instruments . . . with the collection of foreign surveys; and with the publication and supply of charts, sailing directions, and nautical works; and the dissemination of nautical, hydrographic, and meteorological information to the navy and merchant marine.

It shall have charge of all ocean and lake surveys. . . .

* * * *

886. The commanding officer [of a ship] shall report to the Navy Department all important hydrographic or other information that he may acquire concerning the navigation of ships. In case of temporary deficiencies in aids to navigation he shall forward a copy of his report directly to the nearest lighthouse inspector concerned. . . .

887 (1) The commanding officer shall carefully preserve all information that he may receive or be able to procure concerning the safe navigation of a ship.

(2) He shall require the sailing directions, light and beacon lists, and notices to marines of the ship to be compared with those of other ships of the Navy which he may meet having later information on these subjects than his own, and any differences shall be noted.

(3) He shall, when there is any doubt about the safe navigation of routes he proposes to take, or ports he intends to visit, make every effort to obtain from any reliable source, foreign or otherwise, all possible information that will aid him.

888. The commanding officer shall, when his duties and other circumstances permit, make a careful survey and construct a chart of any shoals, harbors, or dangers to navigation, that he may discover or find to be inaccurately located. He shall forward them through the usual official channels, with all the original data and computations used in their construction, to the Hydrographic Office.

889. When passing in the vicinity of suspected dangers or where there are indications of shoal water or danger not on the chart, the commanding officer shall, unless there are good reasons to the contrary, make such search as the weather and other circumstances permit, forwarding to the Hydrographic Office the results, with a track chart showing the traverses made and soundings taken. In the event of no search being made, he shall report to the Hydrographic Office the result of his observations and his reasons for the omission.

* * * *

1010. (1) Previous to entering pilot waters the navigating officer [of a ship] shall study the charts, sailing directions, and other sources of information concerning the navigation of the ship therein, so that he may be prepared to give to the commanding officer any information or assistance required concerning this duty.

1011. The navigating officer shall keep all sailing directions, light and beacon lists of the ship, corrected to date in accordance with personal observations and such other reliable information as he may from time to time be supplied with or be able to obtain; he shall see that the sources of this information are charged against the charts in the proper blank spaces in the chart catalogue; he shall see that all charts are corrected to date before being used. Copies of all information obtained by him affecting navigation shall be forwarded by the commanding officer to the Hydrographic Office.

1012. When hydrographic surveys are made, the navigating officer shall construct on a large scale the charts of the ground surveyed, to be forwarded to the Hydrographic Office.

1013. When determining the position of places whose latitude or longitude, as laid down on charts or recorded in tables, is believed to be in error, the navigating officer shall carefully note the particular spot at which the observations were taken, describing it in such a manner that it may be plotted on a chart, and shall state the number and nature of the observations and the manner in which they were taken. If he obtains the longitude by means of chronometers and meridian distances he shall state the number of chronometers employed, their general character, the age of their rates, and the longitude he assumed as that of the place measured from. A copy of all data as well as the computations made shall be forwarded by the commanding officer to the Hydrographic Office.

1014. So far as practicable with the means and appliances at his command, the navigating officer shall make tidal and current observations at all places visited where careful observations of this kind have not been recorded, and endeavor to ascertain the set and strength of the tides, the limits of their rise and fall, and the time of high water immediately following the periods of a new or full moon.

* * * *

1023. (1) The navigating officer [of a ship] shall carefully prepare all hydrographic reports and meteorological returns required in accordance with instructions and forms from time to time and submit them to the commanding officer for transmission.

(2) If the ship be fitted with a radio outfit and be within communication of any of the shore radio stations under the control of the Government, the navigating officer shall prepare for signature by the commanding officer and transmission by radio to the Weather Bureau, Department of Agriculture, Washington, D. C.,

at least once daily, a report of meteorological conditions, giving the position of the ship at the time. Similar reports shall be transmitted oftener, if practicable, when there is a marked change in the barometer. These daily meteorological reports shall be taken at noon, Greenwich mean time, and reports of observations taken at other times shall indicate the Greenwich mean time of such observations.

BUREAU OF NAVIGATION MANUAL, PART F, HYDROGRAPHIC
OFFICE

F-1001. Duties of Hydrographic Office. (1) The Hydrographic Office is charged by the United States Navy Regulations, Article 443 (II), with the supply of charts, pilots (Sailing Directions), and nautical works to vessels of the Navy. Accordingly, and in order to expedite delivery, vessels requiring outfits or replacements to outfits of the above should make request direct to the Hydrographic Office. The charts and books published by the Hydrographic Office will be found in the General Catalogue of Charts and Books issued to all vessels and offices.

(2) The charts and publications of the nature indicated in paragraph (1) that are published by the War Department, the Department of Commerce, the Panama Canal, and the British Admiralty charts on issue, as shown in the station catalogues, are issued through this office, and direct request to the Hydrographic Office should be made for them when required. They comprise principally the following:

- a. United States Coast and Geodetic Survey Charts.
- b. United States Coast and Geodetic Survey Pilots (Sailing Directions).
- c. United States Coast and Geodetic Survey Tide Tables.
- d. Bureau of Lighthouses Light Lists.
- e. Bureau of Lighthouses Buoy Lists.
- f. United States Lake Survey Charts.
- g. British Admiralty Charts. (See catalogues of charts and plans.)
- h. Steamboat Inspection Service Rules of the Road and Pilot Rules.
- i. Quarantine Regulations and Tariff Bulletins, Panama Canal.
- j. Sailing Directions of the Panama Canal.
- k. Mississippi River charts. (May also be obtained from the branch hydrographic office, New Orleans, La.)

(3) The Nautical Almanac and Ephemeris as well as compass and chronometer record books should be obtained direct from the United States Naval Observatory. List of merchant vessels of the United States should be obtained direct from the code and signal section, Office of Naval Communications. Muir's Navigation should be obtained direct from the Bureau of Navigation.

F-1002. Results of Hydrographic Surveys. When forwarding results of hydrographic surveys or investigations to the Hydrographic Office in compliance with Articles 888 and 1012, United States Navy Regulations, all original data or copy of same should be forwarded.

F-1003. Reports to Lighthouse Superintendent. (1) Attention has been invited by the Department of Commerce to the frequent failure of officers when reporting deficiencies in the established aids to navigation along our coasts to send directly to the nearest lighthouse superintendent a copy of the report concerned, as required by Article 886, United States Navy Regulations.

(2) In order to save time and expedite the correction of the deficiency reported, the nearest lighthouse superintendent should be notified directly by officers observing such defects in the aids to navigation, and it is therefore directed that the provisions of the article above referred to be strictly complied with.

F-1004. Hydrographic Information. (1) Referring to Article 886, Navy Regulations, commanding officers will from time to time, and whenever occurring, submit reports on the following subjects, for the use of the Hydrographic Office:

Aids to navigation—buoys adrift, changes in characteristics, etc.

Currents, ocean and tidal.

Discolored water.

Navigational methods; any new method or wrinkle in theoretical or practical navigation.

Obstructions or dangers to navigation—derelicts, ice, rocks, shoals, sunken wrecks, etc.

Oil, use of, to calm sea; oil spots at sea.

Port facilities, especially of harbors not in United States territory.

Sailing directions; pilotage.

Seismic shocks at sea.

Soundings, particularly in places not well sounded out.

Variation of compass, especially when careful observations show a chart to be at fault.

Waves—measurement of great sea waves.

Criticisms and suggestions—errors in nautical charts and books, constructive criticisms, or suggestions in regard to charts and books; any suggestions tending to safer or quicker passage from place to place.

NOTE.—All purely meteorological data should be kept separate from the above, as they are not collected by the Hydrographic Office but by the Weather Bureau.

(2) Blank forms for inscribing hydrographic information will be furnished by the Hydrographic Office.

F-1005. New Charts. New and extensively corrected charts are issued periodically and automatically, when ready, to ships and offices. It is of importance to the Hydrographic Office to know that the charts and books issued as above or on request, have been received, therefore receipt slips accompany all such issues, and when received with the supplies should be promptly signed and returned direct to the Hydrographic Office.

F-1006. Correction of Charts and Books. Commanding officers should see that charts and books are kept corrected to date, using for correction purposes information from Hydrographic Office, Notice to Mariners, the annual supplements to Sailing Directions, Notice to Mariners published by the Department of Commerce, Hydrographic Office Bulletin, Daily Memorandum, and other reliable publications.

* * * *

F-1009. Collection and Distribution of Hydrographic Information by Radio. The Hydrographic Office collects and distributes by radio all hydrographic information that involves danger to a vessel either through collision or a deficiency in aids to navigation. This information is afterwards confirmed by the Daily Memorandum, Notice to Mariners, and Hydrographic Bulletin. Detailed instructions are given in the Notice to Mariners and Hydrographic Bulletin concerning this system.

The functions, therefore, of the Hydrographic Office as prescribed by law and regulation comprise: Topographic and hydrographic surveys in foreign waters and on the high seas; the collection of nautical data from naval vessels, navigation companies, mariners, foreign hydrographic offices, other United States government agencies, and other sources; the preparation and issuance of maps, charts, sailing directions, navigators, manuals of instruction, and other periodical and special publications essential to safe navigation; the dissemination of hydrographic and other navigational information by the distribution of its publications and by direct contact and radio, telegraphic and other communication with naval officers, mariners and others.

The system of coöperation maintained between the Hydrographic Office and similar foreign offices, with United States naval officers, with navigation companies, and with mariners of all nations, enables the Hydrographic Office to obtain timely nautical information of the greatest importance to navigation and to give out this information promptly to mariners throughout the world, thus contributing very materially to the safety of navigation on all the seas.

To the officers of the United States Navy the charts, books, publications and other special information of the Hydrographic Office are indispensable for the safe and expeditious navigation of the high seas and the foreign coasts. To mariners of the merchant marine of this and other countries, this service is becoming of more and more importance with the increase in number, size, and speed of vessels. Between 5000 and 6000 mariners regularly coöperate with the Hydrographic Office in its collection and dissemination of this information.

The activities of the Hydrographic Office may be considered under four principal heads: Hydrographic and topographic surveys; collection of navigational information; preparation of charts and other publications; and dissemination of navigational information.

Hydrographic and Topographic Surveys. The hydrographic work of the National Government and the topographic work incident thereto, are performed by three separate bureaus in three different government departments, the Hydrographic Office of the Navy Department performing this service in foreign waters and on the high seas; the Coast and Geodetic Survey of the Department of Commerce, on the coasts of the United States and of the island possessions and in rivers to the head of tide water and ship navigation of the United States; and the Corps of Engineers of the War Department, on the American part of the Great Lakes.¹ Some surveys have been made by the Navy Department on special occasions, however, both on the Great Lakes and on the coasts of the United States.

The work of the Hydrographic Office is carried on, as specified in the organic act, "for the improvement of the means of navigating safely the vessels of the Navy and of the mercantile marine." The results of the hydrographic surveys made under the direction of this Office, as well as the information obtained from other sources, are used in the preparation and correction of nautical charts, sailing directions, navigators, manuals of instructions, and other publications and communications.

These surveys of the Hydrographic Office are undertaken either for the construction of original charts of waters where the coun-

¹ See Institute for Government Research, Service Monograph No. 16, The Coast and Geodetic Survey, and No. 27, the Office of the Chief of Engineers.

tries are small and do not undertake their own surveys, or for the correction and revision of charts prepared by foreign countries and published in revised form by the Hydrographic Office. Of 2706 charts issued by the Hydrographic Office, 350 were made from its own surveys.

The original hydrographic and topographic surveys utilized by the Hydrographic Office in the preparation of its charts, sailing directions, and other publications and in otherwise supplying nautical information, are undertaken by civilians paid out of the appropriation "for ocean and lake surveys" and by naval officers who are either on special detail for such work or who perform it in connection with their other duties while on cruises in foreign waters.

All the light cruisers of the Navy carry surveying instruments and have officers and men aboard who are trained in hydrographic work. When a naval vessel starts on a foreign cruise, the Hydrographic Office, anticipating the probable necessity for surveys in foreign waters, supplies it with sounding, triangulation, and astronomical books, and with instructions for the necessary procedure in case orders are received to make such surveys.

In addition to the hydrographic work performed by civilians and naval officers on naval vessels as a part of their duties, large accessions to the data for the charts are derived from observations made by exploring expeditions that are fitted out from time to time, some of which are occasionally sent out at private expense with hydrography as one of the subjects to be investigated.

Much reliable hydrographic work is also performed in connection with the operations of cable steamers belonging to telegraphic cable companies in different parts of the world, the results of which are furnished to and utilized by the Hydrographic Office.

The hydrographic surveys of the Hydrographic Office consist of deep sea soundings to determine the depth and character of the ocean bed, and of soundings and topographic surveys along foreign shores and in harbors, bays, and inlets, to determine the depth and contour and to locate dangers in the nature of shoals, reefs and rocks; astronomical observations for position; observations of magnetic variations; and studies of ocean currents and tides and of other marine phenomena of interest to mariners.

These surveys by the Hydrographic Office are carried on beyond the coastal limits of the United States, frequently within the terri-

torial waters of foreign states. Many of the smaller countries, such as Cuba, Colombia, Mexico, Venezuela, Panama, Haiti, Santo Domingo, and others, do not make surveys of their own coasts, and in these cases permission is readily obtained, when desired, by the vessels of the Navy to make hydrographic surveys.

During the fiscal years 1924 and 1925, considerable new nautical data were supplied by vessels of the Navy, especially vessels equipped with sonic depth finders, and material aid was given by this means to the Hydrographic Office in the checking of reported shoals and the gathering of depth information.

At the request of the Carnegie Institution the U. S. S. "Milwaukee," on her shake-down cruise to Australia, did considerable sounding with the sonic depth finder between the United States and Australia and in the vicinity of the Hawaiian and the Caroline Islands. The U. S. S. "Hull" and "Corey," also at the request of that institution, made, by means of the sonic depth finder, a bathymetric chart showing the Pacific coast and continental shelf, the purpose of this being primarily to assist in earthquake investigations. Soundings were also made at the request of the War Department for the discovery of a practical route for a new cable to be laid between Seattle and Seward, Alaska.

The U. S. S. "Cincinnati," on her shake-down cruise, verified, by means of the sonic depth finder, the existence or non-existence of many doubtful dangers to navigation on the east coasts of South America.

The three specially equipped survey vessels, with their auxiliaries, were engaged, during this period, in survey work in the West Indies and along the north coast of South America. The U. S. S. "Hannibal" completed a survey of the Gulf of Batabano, Cuba, and to the north and west of the Isle of Pines, and was continuing the survey to the east to connect up with surveys east of Cienfuegos, Cuba. In connection with this survey, aerial surveys, of the shore line of the Gulf of Batabano and an aerial map of Port Mariel, Cuba, were made for the Hydrographic Office by the air forces of the scouting fleet. The U. S. S. "Nokomis" completed a survey of the west coast of Haiti, and was continuing a survey of the north coast of Cuba in the vicinity of Cardenas and Matanzas. The U. S. S. "Niagara" was surveying along the coasts of Venezuela and Colombia.

The Hydrographic Office, during the past forty years, has been carrying on a system of measuring differences of longitude by the exchange of telegraphic time signals among places connected by submarine cables. In this way, about forty secondary meridians situated in the West Indies, Mexico, Central and South America, China, Japan, Siberia, the East Indies, the Philippines, and Europe, have thus been accurately related to the meridian of Greenwich. The latitudes of these places were established at the same time by exact observations.

Collection of Other Navigational Information. The Hydrographic Office keeps in touch, by mail, telegraph and radio not only with naval officers on cruises in all parts of the world, receiving and distributing nautical information in the Navy Department, but it also maintains contacts with the mercantile marine of the world receiving reports from officers of navigation companies, shipmasters, and marine observers, from other United States government offices, and from foreign governments.

Of the 5000 to 6000 observers of the Hydrographic Office, about 3000 regularly forward hydrographic information, and the rest, the number of which is variable, forward observations and records from time to time. By this means a steady stream of hydrographic information is constantly flowing into the Hydrographic Office. An idea of the nature and volume of this information may be obtained from the statement that during the fiscal year ending June 30, 1925, there were received from observers, 10,595 current reports; 1758 marine data reports; 429 route reports; 266 radio facilities reports; 177 port facilities reports; 501 bottle papers; and 283 intending observers' addresses.

The Hydrographic Office, in order to maintain a complete understanding with its coöperating observers, acknowledges all letters from mariners giving nautical information, informs them what use is made of their reports, and makes such suggestions as may be needed to enhance the utility of their reports.

The contacts with observers are maintained both through the central office in Washington and through seventeen branch offices located where seafaring and commercial people can come into personal business relations with the officers who are in charge of this work. In this way a voluminous business is carried on between the Hydrographic Office and the maritime interests.

By the coöperation of other government agencies, the Hydrographic Office receives information concerning the survey of our own coasts and island possessions from the Coast and Geodetic Survey of the Department of Commerce; the survey of the Great Lakes, from the Engineer Corps of the War Department; information concerning changes in lighthouses along the coasts of the United States from the Bureau of Lighthouses of the Department of Commerce; meteorological reports, from the Weather Bureau of the Department of Agriculture and notices of icebergs from the Coast Guard of the Treasury Department.

By coöperation with foreign governments and through its participation in the International Hydrographic Bureau at Monaco, it exchanges charts and other publications and gives and receives special nautical information especially such as relates to changes in lights, buoys and other navigational marks, the discovery or removal of shoals and other dangers to navigation, and ocean phenomena.

Marine data are regularly furnished the Hydrographic Office by mariners on observers' blanks supplied by that office. The data are handed in or mailed by the mariners promptly upon their arrival in port, to the Hydrographic Office or the nearest branch office, or if delivered abroad, to an American Consul who forwards the information.

In November, 1921, a radio broadcasting service was inaugurated by the Hydrographic Office whereby mariners sighting anything unusual at sea, defective or displaced navigational marks, or any peculiar sea disturbance, may immediately send radio messages, concerning them to the Hydrographic Office.

Some information concerning ocean currents is obtained by means of sealed bottles thrown overboard by mariners and subsequently picked up. Mariners are requested by the Hydrographic Office to drop overboard bottles containing a form provided by the latter and properly filled out. This form calls for the date, the latitude and longitude where the bottle was dropped, and the name of the vessel and of its captain. Finders of these bottles are requested to transmit the enclosures to the Hydrographic Office with a statement of the date and place of finding. When received, these bottle reports, or bottle paper drifts, as they are called, are of assistance determining the strength and move-

ment of ocean currents. Short items, based on this information are prepared and published from time to time in the Hydrographic Bulletin.

The information derived from both governmental and private sources is classified into two groups: Reports relating to aids to navigation, such as lighthouses, light vessels, radio compass stations, beacons, buoys, shoals and wrecks, for use in the correction of charts and the revision of Sailing Directions and Light Lists, and which is published for this purpose in the weekly issues of the Notice to Mariners; and reports concerning matters of a transitory nature, such as the location of icebergs, derelicts, mines, and other drifting obstructions or menaces to safe navigation, which information is disseminated by broadcasts, bulletins, and other publications.

Preparation of Charts and Other Nautical Publications. The mass of nautical information obtained by the Hydrographic Office from surveys and other observations of naval officers, from mariners of the merchant marine of the various countries of the world, and from other official and private sources, is utilized in the construction and revision of nautical charts, tables, manuals, and sailing directions, and in the preparation of periodical publications, bringing all important matter necessary for safe navigation to the latest possible date.

The construction of the charts issued by the Hydrographic Office involves the publication of the results of original marine hydrographic surveys made under the naval service of the United States, and the republication of foreign surveys in whole or in part, on a scale determined by the Hydrographic Office. There is a general understanding among all nations that they may reproduce, but not in facsimile, all the charts of one another, provided the legend on each reproduced chart shall indicate its origin.

A great amount of work is involved in the revision and alteration of the nautical charts of foreign countries before they are ready for reproduction by the Hydrographic Office. A careful examination and correction must be made of each chart to determine its present accuracy, taking into consideration the latest information received from the Navy and the merchant marine, and by exchanges with other agencies. The various foreign hydrographic offices do not use the same system of conventional signs and when utilized in

our charts the signs have to be brought into conformity with our method of presentation. The charts are, in many cases, published in foreign tongues, and the terms used have to be translated into English. Most countries take their soundings and other measurements in accordance with the metric system, and these have to be computed and transcribed in terms of our own measurement.

Much careful work is involved in adjusting all the information used in the redrafting of the chart so that when completed it is sufficiently accurate to enable the mariner to ascertain his correct position and secure safe navigation. Whenever an adjustment cannot be worked out with certainty, a caution is printed in red ink to give notice to the mariner that the chart is not absolutely accurate.

When foreign charts are dealt with which are correct and which have the same scheme of soundings, etc., they are simply changed to conform to United States practices and are then reproduced, without involving the expensive computations and alterations required in other cases. In 1923 the Hydrographic Office developed a special application of the pantograph, which is now in use, by which a chart is engraved on copper by etching instead of being engraved by hand on a copperplate.

The work of chart construction in the Hydrographic Office involves not only the preparation, correction and alteration of the original charts, but also the mechanical processes involved in their reproduction and distribution. All the work of photographing, engraving, electroplating, lithographing, and plate printing of charts is done at this Office.

Among the new engraved charts completed during the fiscal year 1925, were the eastern and western sheets of the North Pacific Ocean series. There were also completed in that year, a general chart of the Mediterranean Sea, and a series of charts embodying the latest surveys and information of the Caroline Islands group, and a new time zone chart of the world on a large scale. A chart was under construction showing the coasts of North and Central America from the Gulf of St. Lawrence to Juan de Fuca Strait, also a series of charts of the southwest coast of Chosen (Korea).

While the Hydrographic Office has on issue 2706 charts of foreign waters, and the Coast and Geodetic Survey has 672 charts of the Coasts of the United States and territories, the United States

still lacks base plates for 976 charts in order to make the Navy and merchant marine of the United States independent of foreign sources for its chart supply. These missing charts are being obtained by purchase, although with considerable delay, from the British Admiralty, in such quantities as are needed to supply vessels of the Navy in active commission. A reduction of about 100 in the number of missing charts is being made from year to year, however.

The Coast and Geodetic Survey charts required for naval purposes are furnished by that bureau to the Hydrographic Office in such quantities as are needed, and the latter assembles and catalogues them by station portfolios for issue, such hand corrections being made as may be necessary to bring them up to the date of issue. The Hydrographic Office, however, still produces Great Lakes charts of Canadian territory, including the St. Lawrence River below Cornwall.

In constructing the charts of foreign waters, much consideration is given to military requirements so that accurate charts may always be available of areas in which our vessels must operate. These charts are regarded by the Navy Department as munitions of war.

At the close of the fiscal year 1925 the Hydrographic Office had on general issue 2706 Hydrographic Office charts. During the year, 120 new charts were made, and twenty-five were canceled. In addition there were 196 confidential, secret, and special charts for naval uses only. Of the charts on issue, 345 were from original surveys by the Hydrographic Office, the rest being reproductions, after corrections and alterations, of charts made in other countries. There were also on issue at the Hydrographic Office 976 British Admiralty charts and 672 Coast and Geodetic Survey charts. There were issued during that year by the Hydrographic Office 1772 editions of charts resulting in the printing of 1,157,286 copies, of which 290,765 were what is known as Hydrographic Office charts; 315 were naval operations charts; 4650 were anchorage charts; 197,100 were pilot charts; 268,000 were pilot chart supplements; 58,600 were chartlets for Notices to Mariners; 1400 were mine warning charts; 93,075 were index charts for Hydrographic Office publications; and 243,381 were miscellaneous prints.

Besides the preparation and publication of the nautical charts, a large part of the work of the Hydrographic Office consists of making mathematical computations for, and compiling, editing, and preparing for publication the books, pamphlets, and bulletin sheets, some of which are issued periodically. The Hydrographic Office is required by law¹ to provide "accurate and cheap nautical charts, sailing directions, navigators, and manuals of instructions for the use of all vessels of the United States and for the benefit and use of navigators generally." It is the only government agency which has the statutory obligation to issue the Navigator and manuals of instruction for mariners. These publications issued are the Sailing Directions (Pilots), Lists of Lights (foreign), the American Practical Navigator, the International Code of Signals, various manuals and astronomical and mathematical tables used in navigation, which are published when necessary, and the periodical publications known as supplements to Sailing Directions, published annually; Pilot Charts, two of which are published quarterly, and four, monthly; Notice to Aviators, published monthly; Air Pilots, Notice to Mariners, Hydrographic Bulletin, Corrections to Light Lists, and Ice Supplement, North Atlantic Pilot Chart, each published weekly; the Daily Memorandum; and mine warnings, published whenever such warnings are received.

As the information contained in these publications is received from many different sources, much work is required to examine, route, analyse, digest, translate, and edit it.

In addition to the activities mentioned above, the Hydrographic Office was engaged in the following miscellaneous work in connection with chart construction during the fiscal year, 1925:² Making a special mercator chart for the U. S. S. "Shenandoah" to navigate across the United States from Lakehurst, N. J., to San Diego, Cal.; surveying and laying out a calibration course on the Potomac River for standardizing airplanes for the naval air station, Anacostia, D. C.; charting and indexing deep-sea soundings furnished by cable ships and others equipped with the new sonic depth finder and plotting these on the new deep-sea plotting sheets; constructing the 1925 "Variation of the Compass," "Magnetic inclination or dip," and "Horizontal intensity" charts; computing of natural

¹ See page 91.

² Annual Report, 1925, pp. 6-7.

scale for all new charts and all old charts as they were reprinted during the year; preparing data and special charts for the use of the MacMillan polar flight expedition; making working drawings for new instruments and appliances for the office; preparing drawings and type matter for the new plates to be furnished the International Hydrographic Bureau for study in connection with the proposal for standardizing the system of buoys, beacons, and storm warnings of all nations; plotting and arranging data furnished by the Mixed Claims Commission of the World War to facilitate the adjudication of claims; drawing illustrations for satellite diagrams and lithographing same for inclusion in the Nautical Almanac for the Naval Observatory; preparing special charts for fleet maneuvers in the Pacific Ocean; making charts showing progress of surveys; investigating various reports made by mariners and plotting data furnished by the same; writing specifications for surveys in the field; making diagrams for pilot charts; calculating conversion tables; making diagrams for compensating errors due to perspective in aerial photographic surveys; collaborating on the standardizing of topographic and hydrographic symbols for charts; making studies of Japanese characters and symbols for maritime charts.

Dissemination of Navigational Information. The Hydrographic Office disseminates its nautical information by means of its publications, by special mail, telegraph, cable, and wireless communication, and by direct contact with mariners through the central office and its branch hydrographic offices and agencies.

All vessels of the United States Navy, when starting on voyages, are supplied by the Hydrographic Office with the necessary navigational manuals and portfolios containing complete sets of such charts as may be needed on their voyages.

In addition to the detail charts to be used for navigation at the place of destination, this portfolio contains a set of general charts, so that if a change is ordered in the voyage by the Navy Department after the vessel has sailed, it may be enabled to reach its new destination by means of these charts. Whenever such a change is ordered by the Navy Department, the Hydrographic Office immediately sends to the new destination of the vessel such detail charts as may be needed. There are at present forty-eight different naval portfolios containing sets of charts for the various parts of the globe. If a ship goes to Asia she will get a complete set of

chart portfolios for that station, complete Chinese and Japanese charts, etc., and certain general charts of, say, South America and Europe. If the vessel is suddenly ordered to Europe she would have enough charts to get to Europe, where the Hydrographic Office will send detail charts of that section of the globe to meet her.

For the dissemination of nautical information to mariners and all others in need of it, the Hydrographic Office has established branch offices in seventeen different ports, where, as at the central office, contacts are made with mariners seeking advice and information or volunteering services in the observation of marine phenomena; with navigation companies; and with the public generally. Mariners constantly visit these branch offices to give and to receive nautical information and to obtain the correct time; masters of vessels go there before starting on voyages, because they may obtain the latest information for all the ports of the world, and particularly for the ports to which they are sailing, regarding charts, sailing directions, dangers to navigation, etc. Wherever the branch office personnel is sufficient, nautical experts are sent out to visit vessels in order to collect information and to distribute Hydrographic Office periodicals. To those who regularly supply information to the Hydrographic Office for use in the preparation of its publications, the Pilot Charts, Notices to Mariners and the Hydrographic Bulletin are furnished free of charge. The Hydrographic Office and its branch offices are open for business daily from 9 A. M. to 4.30 P. M. In general, it is the policy of the Hydrographic Office to encourage mariners to regard that Office and its branches as their own institution to which they may turn for guidance in nautical matters.

For the sale of its hydrographic charts and publications, which may also be purchased at the central office, the Hydrographic Office has established sales agencies at seaports in this and foreign countries, where navigation charts and other publications can be obtained at the actual cost of printing and binding.

The Hydrographic Office disseminates information received from the international ice patrol vessels of the transatlantic steamer lanes warning vessels of icebergs, derelicts, etc. The American patrol is performed by the Coast Guard, and the combination of these two agencies has produced a service that has greatly reduced

the dangers from icebergs in the North Atlantic. The duty of the Hydrographic Office in this respect is to receive radio information from ships and broadcast it through the numerous radio stations to all ships of the world, besides issuing a weekly publication giving notice of floating ice.

The following table shows the distribution of periodical publications by the Hydrographic Office during the fiscal year 1925:

Name of publication	How often produced	Number of copies	
		Each edition average	Annual
Daily Memorandum (306 days).....	Daily	494	151,164
Notice to Mariners (52 weeks).....	Weekly	5,450	283,400
Extracts from Notice to Mariners (52 weeks).....	do	3,000	156,000
Hydrographic Bulletin (52 weeks).....	do	4,175	217,100
Corrections to Light Lists (52 weeks).....	do	1,100	457,600
Notice to Aviators.....	Monthly	1,000	12,000
Mine warnings to mariners and supplements including chartlets	When received	1,500	1,500
North Atlantic Pilot Chart.....	Monthly	5,250	63,000
Ice Supplement to North Atlantic Pilot Chart.....	Weekly	4,175	217,100
North Pacific Pilot Chart.....	Monthly	3,350	40,200
Indian Ocean Pilot Chart.....	do	1,575	18,900
Central American Pilot Chart.....	do	4,150	49,800
South Atlantic Pilot Chart.....	Quarterly	1,950	7,800
South Pacific Pilot Chart.....	do	1,950	7,800
Total		39,119	1,683,364

CHAPTER III

ORGANIZATION

The Hydrographic Office is a service attached to the Bureau of Navigation of the Navy Department, operating under the provisions of the act of June 21, 1866. Its activities in Washington, D. C., are distributed among five divisions, which in turn have nineteen subdivisions or sections and subsections. There are seventeen branch hydrographic offices outside the city of Washington.

The five divisions are: Administration, Maritime Security, Nautical Research, Chart Construction, and Distribution.

The Hydrographic Office is under the immediate direction of a naval officer designated as the Hydrographer. The personnel of the Hydrographic Office consists of nine commissioned naval officers, including the Hydrographer, and 153 civilians at the central office and sixteen commissioned naval officers and twenty-two civilians at the branch offices. The civilian employees are mostly specially trained hydrographic engineers, nautical scientists, computers, engravers, and lithographers, with the usual complement of clerks and sub-clerical employees.

Office of the Hydrographer. The office of Hydrographer of the Navy was created by order of the Secretary of the Navy, dated January 21, 1871, which reorganized and defined the functions of the Hydrographic Office. The Hydrographer is a commissioned naval officer, the present incumbent having the rank of a captain of the Navy. He has general control and supervision over all the work of the Hydrographic Office, its surveys and its branch offices. In his administration of the Office he is assisted by a naval officer with the rank of commander, who is designated as Aide to the Hydrographer.

Division of Administration. The Division of Administration has charge of the procuring, collecting, and routing of information, and the maintenance of files, archives, and library; all matters pertaining to finance and supplies, such as budget estimates, appro-

priations, requisitions, expenditures, printing allotment, and office and field supplies; administrative supervision of branch hydrographic offices and field parties; conduct of relations with the International Hydrographic Bureau and other sources of hydrographic information; the sale of Hydrographic Office charts and publications and the accounts with sales agents; and supervision over the civilian personnel in the office and in the field.

This Division consists of four sections, General Administration, Files and Archives, Administration and Finance, and Purchase and Supplies. Its personnel consists of the Aide to the Hydrographer, in charge, a civilian Administrative Assistant, who is also a section chief, and eleven other civilian employees.

General Administration Section. The office of the Chief of the Division of Administration is known as the General Administration Section. This Section assigns, coördinates, supervises, and is responsible for the promptness and accuracy of the work of the Division; it coördinates the activities of other divisions; keeps the Hydrographer informed of the nature and status of the work of the Office; receives information of interest to the Office from all parts of the world, which it indexes, catalogues, and routes to the proper divisions; and acknowledges receipt of letters, reports, and other documents.

The work of this Division is carried on by the Aide to the Hydrographer, who is in charge, the civilian Administrative Assistant, a senior clerk, who is also in charge of the Section for Files and Archives, and ten other civilian employees.

Files and Archives Section. The Files and Archives Section receives, opens, records, and routes the incoming mail; indexes and files correspondence and reports of hydrographic data, obstructions, and aids to navigation received from observers and other sources; indexes, stores, and makes available for use all general and confidential survey data; catalogues and stores the archives of the Office, such as the technical reference documents, books, pamphlets and library material which contain original information of permanent value. The personnel consists of five civilian employees.

Administration and Finance Section. The functions of the Administration and Finance Section are those usually assigned to the office of the chief clerk of a government unit. The Section handles all matters pertaining to the budget, personnel, supplies, sale of

charts, and other publications; centralizes and coördinates these items as they relate to the other units of the Office; keeps all appropriation accounts; prepares requisitions, vouchers, and statements for personnel, material, and printing allotments; administers such branch office affairs as relate the budget, civilian personnel, supplies, equipment, and reports; keeps personnel records, including list of names and addresses of all officers and civilian employees of the Office, time records, payrolls, classification records, and efficiency reports.

Its personnel consists of the Administrative Assistant and five other civilian employees.

Purchase and Supplies Section. The Purchase and Supplies Section centralizes the procurement, care, and issue of all materials, supplies, and blank forms. It keeps records of all material and equipment; has charge of the maintenance of supplies and their procurement and custody, and issues supplies to the central office and to the branch offices. It also looks after requests for repairs and alterations to the building and equipment.

The work of this Section is carried on by a supply clerk and such other persons as may be temporarily transferred from other sections and divisions when needed.

Division of Maritime Security. The Division of Maritime Security receives, passes upon, and disseminates to the maritime world, information of value to safe navigation. It has charge of the preparation, revision and editing of Sailing Directions, Light Lists, Radio Aids to Navigation, Notice to Mariners, Notice to Aviators, Memorandum to Aviators, Naval Air Pilot, Pilot Charts, Hydrographic Bulletins, and Daily Memoranda; the issue of radio-grams for broadcasting, and such similar bulletins, notices, and charts as are issued from time to time, including mine warnings, ice reports, and data concerning ocean currents, best routes, etc., and supplements to various publications.

The Division is subdivided into seven sections, namely, Nautical Data, Aerial Navigation, Light Lists, Notice to Mariners, Pilot Charts, Route Information, and Sailing Directions.

Its personnel consists of a naval officer with the rank of lieutenant commander, in charge, another naval officer with the same rank, and a lieutenant of the Navy, in charge of two sections, and twenty-one civilian employees.

Nautical Data Section. The Nautical Data Section is a correspondence unit, the function of which is to keep up contacts with marine observers and others who supply the information required by the office in the prosecution of its work. It keeps a card index of about six thousand marine observers, over half of whom report hydrographic information regularly. The card index covers ships, steamship companies, and masters of vessels. An extensive correspondence is carried on by this section, and drives are made from time to time to increase the number of active observers.

The personnel of this section consists of two clerk-stenographers.

Aerial Navigation Section. The Aerial Navigation Section prepares for publication and edits the Notice to Aviators, the Naval Air Pilot, and the Memorandum for Aviators, and assists other divisions and sections in the preparation of aviation information, charts, and other aviation data.

The work of the Section is carried on by a naval officer with the rank of lieutenant.

Light Lists Section. The Light Lists Section prepares and revises the Hydrographic Office Light Lists and the Radio Aids to Navigation, and keeps copies of these publications corrected to date. It keeps on hand for reference a complete set of charts of the latest dates issued by all nations, including for the United States, the charts of the Hydrographic Office, the Coast and Geodetic Survey and the Army Engineer Corps (United States Lake Survey); it supplies other divisions and sections with radio and light information; and it verifies such information before its publication by other sections.

The work of the Section is performed by a civilian Nautical Engineer.

Notice to Mariners Section. The Notice to Mariners section prepares for publication the weekly "Notice to Mariners," which contains current information necessary to safeguard navigation and used in the correction of navigational charts, Sailing Directions, Light Lists, and other publications.

The personnel of the Section consists of a Nautical Engineer in charge two Nautical Engineers, a chief engineering aid (translator), a laborer, and a typist.

Pilot Chart Section. The Pilot Chart Section has charge of the preparation and publication of the Pilot Charts, the Daily Memo-

randum, the weekly Hydrographic Bulletin, the Ice Supplements to the Hydrographic Bulletin, and the Mine Warnings. It prepares radiograms relating to nautical information for broadcasting. During the ice season, it keeps a daily record of ice movements. It investigates and collects information relating to ocean currents, supplies such information to other divisions and sections, and prepares for publication the data regarding ocean currents. It keeps on hand for reference a complete set of Maury's Wind and Current Charts, and bound volumes of the Pilot Charts, Hydrographic Bulletin, and Daily Memorandum.

The personnel of the Section consists of a Nautical Engineer in charge, two other Nautical Engineers, two engineering aides, a typist, and a clerk, all of whom are civilians.

Route Information Section. The Route Information Section is charged with the duty of preparing ocean route information for Sailing Directions, investigating and revising present ocean routes, and recommending new routes when deemed advisable.

The work of the Section is performed by a naval officer with the rank of lieutenant commander.

Sailing Directions Section. The functions of the Sailing Directions Section are to prepare and revise the fifty-eight volumes of Sailing Directions for publication and to prepare and publish yearly Supplements to Sailing Directions. It keeps on hand, corrected to date, a set of "Standard Sailing Directions," and keeps for reference the latest copies of foreign Sailing Directions.

The personnel of the Section consists of a Nautical Engineer, in charge, two other Nautical Engineers, and two engineering aids.

Division of Nautical Research. The function of the Division of Nautical Research is to carry on research "for the improvement of the means of navigating safely the vessels of the Navy and the mercantile marine" as required by the organic act. It keeps pace "with the progress of knowledge and the applications of science in nautical astronomy, in surveying, and in mathematical cartography, and in those branches of geophysics which must be taken account of in navigation."¹

This Division is the laboratory where intensive studies are made of the scientific and mathematical material which constantly flows

¹ Annual Report, 1922, p. 44.

into the Hydrographic Office in the form of reports of hydrographic surveys and astronomical, magnetic, and other scientific observations, the results of which are either published for the use of navigators and scientists or kept on record and constitute important parts of the working equipment of the Hydrographic Office. It has supervision over all publications dealing with navigational data, involving computations for finding a ship's position at sea, the nature of the bottom of the oceans, terrestrial magnetism, variation of the compass, nautical astronomy, and various other subjects.

In this Division are prepared the published epitomes and manuals of the methods and practice of nautical astronomy and navigation used by navigators in keeping their reckoning on the sea—a service which the Hydrographic Office alone of American institutions has the statutory obligation to perform. Here also are produced, at timely intervals, the epoch-charts of the world in which are projected the Halleyian loci of equal values of the variation of the compass, the inclination of the magnetic needle, and the horizontal intensity of the earth's magnetism, to furnish the means for assigning the correct direction of the magnetic meridian in all the official charts and pilots, and, moreover, to provide the fundamental data used in the computations of navigators for deducing the characteristics of the magnetism of ships and the deviation of the magnetic compass.

The work of the Division is performed by a civilian senior scientist,³ assisted by a nautical scientist.

Division of Chart Construction. The Division of Chart Construction has charge of constructing, compiling, drawing, engraving, and printing all the charts published by the Hydrographic Office; the care and correction of the chart plates; the mathematical computations for the construction of charts; and the maintenance of the necessary records and files of the Division.

The Division comprises seven sections, namely, Ocean and Lake Surveys, Construction, Compilation, Reconstruction, Drafting, and Engraving and Lithographing. The Lithographic Section has five subsections on: Lithographic Drafting, Photography, Lithographic Transfer, Lithographic Printing, and Plate Printing.

³ Before the Classification Act of 1923 became effective, this officer was designated as "hydrographic engineer" in the appropriation acts.

The Division is in the charge of a naval officer with the rank of commander. A civilian senior engineer has immediate supervision over a force of ninety-four other civilian employees.

Ocean and Lake Surveys Section. The Ocean and Lake Surveys Section, which is under the immediate direction of the Chief of the Division and the Senior Engineer, concerns itself with the field operations of the three survey ships which are operating under the supervision of the Hydrographic Office. The Chief, with the assistance of the Senior Engineer, makes recommendations to the Hydrographer for surveys to be undertaken either by the regular naval survey expeditions or in connection with other naval service activities, and prepares specifications for such surveys when directed by the Hydrographer. The Chief of this Division, in coöperation with the Chief of the Division of Administration, prepares the correspondence relating to the necessary acquiescence of foreign governments concerned in surveys to be undertaken. Five civilian Hydrographic Surveyors, four Junior Engineers and one draftsman are attached to the three survey ships for field duty.

This Division has no personnel other than as above mentioned.

Construction Section. The Construction Section concerns itself chiefly with the construction of new charts to be engraved. In the preparation of each chart, it collects the necessary data to be used, has the photoprints made, prepares the detailed specifications for its construction, and revises the engraved or lithographed proofs. In the preparation of the chart data, it lays out the schemes of territory to be charted; determines the scale to be used and the limits of the charts; searches out the best available data from existing charts, from books or from other sources; and compiles the necessary preliminary information. It investigates and furnishes the information for the construction and correction of all confidential and special charts, such as anchorage, rangefinder, and compass testing, radio compass, aviation, telegraph, cable, and pilot charts. It keeps records of longitude; deep-sea soundings; telegraph, radio, and cable stations of the world; and such charts and other information records as are necessary for the prosecution of the work. It reports for filing in the Reconstruction Section, all localities requiring survey, resurvey, or investigation. Errors, omissions, changes, or additions affecting hydrographic charts or books, when discovered, are reported to the proper divisions.

The personnel of the Section consists of an engineer, in charge, nine other engineers, and four other civilian employees.

Compilation Section. The Compilation Section compiles, prepares, and standardizes data for new original charts that have gone through one or more editions and require extensive corrections or new plates to replace old ones that are worn out, also for new Hydrographic Office charts to replace British Admiralty charts on issue by the Hydrographic Office; the data being prepared for photolithographing or engraving as required. The Section investigates and compares all available data which enter into the compilation of the originals, whether on existing charts or in books, documents, atlases, periodicals, or miscellaneous maps. It keeps a record of geographic names and such chart and other records as are needed in its work. This Section also reports to the proper sections and divisions, localities requiring survey, resurvey, or investigation, and such errors, omissions, changes, and additions as are discovered in the course of its work.

The personnel of the Section consists of an engineer, in charge, an assistant engineer, and two engineering draftsmen, all of whom are civilians.

Reconstruction Section. The Reconstruction Section keeps the Hydrographic Office charts on issue revised and corrected to date. To this end it maintains card indexes of charges^{*} against all Hydrographic Office and miscellaneous charts; makes routine charges from Notices to Mariners; compares all complimentary and foreign charts received, and scrutinizes all documents affecting charts, all books, magazines, and miscellaneous information received that might require charges against Hydrographic Office charts; prepares the copy for all corrections to Hydrographic Office charts, or turns over to the Construction Section or the Compilation Section, all data on hand when new chart plates are required; reads proof of charts and revises the engravers' work; keeps a record of doubtful dangers in all oceans and a file of localities requiring survey, resurvey, or investigation; and reports to the proper divisions, errors, omissions, and required changes and additions, affecting charts and other publications of the Hydrographic Office.

^{*} Any information gleaned from documents or other sources to be utilized in the revision or correction of a chart is called a "charge" against that chart.

The work of the Section is performed by an engineer, in charge, and three assistant engineers.

Drafting Section. The Drafting Section does all the drafting work of the Hydrographic Office, and at times does drafting work for other bureaus and offices. Its functions comprise the plotting of surveys from field notes and making adjustments and computations of survey data when required; constructing from survey data, the original drawings needed for engraving new charts and making the necessary computations therefor; making drawings for all existing Hydrographic Office charts which require reengraving; constructing or preparing original drawings from foreign surveys or charts to be used for engraving new Hydrographic Office charts and making necessary computations therefor; drawing originals for photolithographic reproduction; performing drafting work in connection with extensive corrections of copper and zinc plates, and miscellaneous drafting for other bureaus and offices when required; mounting charts and matching and joining the same; doing lithographic composing when required; keeping a general chart file of all editions of Hydrographic Office charts, and files of all originals for engraved and photolithographed charts and of originals for all special charts; and reporting to the proper section, all localities requiring survey, resurvey, or investigation.

The personnel of the Drafting Section consists of an Engineer, in charge, and an engineer and two junior engineers, nine engineering draftsmen, and a compositor and an apprentice draftsmen, all of whom are civilians.

Engraving Section. The Engraving Section engraves the hydrographic nautical charts on copper plates; corrects existing chart plates according to the latest information; electrotypes chart plates; inspects all copperplates prior to their use; and keeps a record of defective plates and those out of condition.

The work of the Section is performed by a Chief Engraver, in charge, thirteen engravers, and four engraving machine operators.

Lithographic Section. The Lithographic Section performs all necessary work in connection with the lithographic reproduction of regular and special Hydrographic Office charts, Pilot charts, and miscellaneous lithographic and plate printing. The work of the Section is distributed among five subsections of namely, Lithodrafting, Photography, Litho-transfer, Litho-printing, and Plate

Printing, the functions of each of which are indicated by their titles.

The personnel consists of a chief lithographer, in charge, and thirty-nine other skilled workers.

Division of Distribution. The Division of Distribution is charged with the supervision of the distribution of charts of the Hydrographic Office, the Coast and Geodetic Survey, and the British Admiralty, and the issue of confidential charts to the vessels of the United States Navy; also the supply of navigational books and publications issued by the Hydrographic Office to naval vessels and to the maritime world. The Section regularly carries a stock of over half a million charts to meet the demands that are made upon it. By coöperating with the Office of the Chief of Naval Operations the Division keeps informed at all times of the localities and quantities of charts necessary to meet probable future requirements of the fleets. Whenever corrections on Hydrographic Office charts are so numerous or of such a nature as to warrant new editions, this fact is reported to the Division of Chart Construction.

As charts are subject to continual change, this Division is charged with keeping all charts in stock corrected to the date of issue, the corrections being chiefly obtained from Notices to Mariners and by the comparisons of foreign charts.

The work of the Division is distributed among four sections, namely, Chart Stock, Catalogues and Proof Reading, Issue, and Mailing Lists.

The personnel consists of a naval officer, with the rank of lieutenant commander, in charge, one assistant Nautical Engineer, and twenty-four other civilian employees.

Chart Stock Section. The Chart Stock Section keeps on hand a sufficient supply of Hydrographic Office and other charts to meet all probable requirements of the Navy and merchant marine; makes the hand corrections to date of issues from the Notice to Mariners, on the supply of Hydrographic Office, Coast and Geodetic Survey, and British Admiralty charts, and keeps a "Standard" set of these charts on hand for comparison; advises the chief of the division whenever the corrections on Hydrographic Office charts warrant new editions; examines these charts and compares them with the "Standards" as soon as they are deposited in the

section, all errors found being reported to the Divisions of Chart Construction and Maritime Security.

The work of the Section is performed by eleven draftsmen.

Catalogue and Proof Reading Section. The functions of the Catalogue and Proof Reading Section are: to keep the sales agents informed, through the Notice to Mariners and the Daily Memorandum, of the publication of new and extensively corrected charts, to keep the agents properly instructed concerning these charts and to advance the sale of the latter; to keep the general and station catalogues corrected to date and to prepare them for publication; and to examine for criticism the first proofs of Hydrographic Office charts.

The work of the Section is performed by a chief engineering draftsman and a clerk.

Issue Section. The functions of the Issue Section are to keep on hand sufficient supply of British Admiralty, Coast and Geodetic Survey, and confidential charts, to meet the probable requirements of the Navy; to procure and issue these and other special charts when requested; to supply chart outfits to naval vessels and stations; to supply new editions of all charts to United States naval vessels, stations, foreign governments, and branch offices; to correct by hand to date of issue, all nautical books to be supplied to United States naval vessels, stations, and offices; to keep on hand for issue, a sufficient supply of Hydrographic Office and Department of Commerce publications to meet the probable requirements of the Navy and merchant marine; and to pack, mail, express, or otherwise transmit charts and publications to their destinations.

The personnel of the Issue Section consists of a clerk-stenographer, a clerk, and six laborers, who are under the direct supervision of the assistant Nautical Engineer.

Mailing Lists Section. The Mailing Lists Section keeps accurate mailing lists corrected to date. Lists are kept of ships in commission attached to the different stations, separate lists being kept of the Atlantic Fleet, the Pacific Fleet, the Asiatic Fleet, navy yards, and naval stations and districts; offices, including those in the Navy Department; foreign government exchange lists; branch hydrographic offices; sales agents; and recipients of the publications, Notice to Mariners, Pilot Charts, Hydrographic Bulletins, and Daily Memorandum.

The work of the Section is performed by an addressing machine operator and two laborers, except that on mailing days laborers from other Sections are assigned to this work.

Branch Offices. The seventeen branch offices of the Hydrographic Office, which come under the administrative control of the Division of Administration are located in the ports of Boston, New York, Philadelphia, Norfolk, Baltimore, Savannah, New Orleans, Galveston, San Francisco, Portland (Oregon), Duluth, Seattle, Saulte Ste. Marie, Chicago, Cleveland, Buffalo, and San Juan, Porto Rico, each of them being in the charge of a commissioned officer of the Navy. By authority of the Governor of the Panama Canal, some of the duties of branch hydrographic offices are performed by the captains of the ports at Cristobal and Balboa. A Hydrographic Information Office under the Commandant at Honolulu also performs some of the duties of an officer in charge of a branch office. A branch office at Portland, Maine, established by law is not operating at present. Provision has been made for a branch hydrographic office at Los Angeles to be opened July 1, 1926.

Whenever practicable, these offices are located in the custom houses or in buildings occupied by the Maritime Exchanges, where shipmasters and others interested in navigation may have their charts compared and corrected and obtain access to the latest publications of the Hydrographic Office and information upon nautical subjects.

The branch offices are equipped with reference libraries of charts and Sailing Directions of the world, corrected to date, and are supplied with the latest obtainable hydrographic information for the use of mariners visiting the ports, with whom the offices maintain close contact. The officers in charge, board ships for the purpose of collecting marine data, compare and adjust navigational instruments, furnish local time, and give instructions and answer inquiries in matters pertaining to hydrography and navigation. These offices are also distributing points for Pilot Charts, Hydrographic Bulletins, Notices to Mariners, and Reprints to coöperating observers. No publications are sold at the branch offices.

The service on the Great Lakes, which was recently reorganized, has headquarters at Sault Ste. Marie, bringing the entire hydrographic service on the Lakes under one head for closer coördina-

tion and greater coöperation with other service organizations, such as the Coast Guard, the Engineer Corps, the Weather Bureau, the Lighthouse Service, the Lake Carriers' Association, and government and private radio stations.

The Coast Guard maintains quasi-branch hydrographic offices at Portland (Maine), Portsmouth (New Hampshire), and Charleston (South Carolina).

In addition to the branch offices, the Hydrographic Office has arrangements with sixty domestic and seventeen foreign commercial houses located in important seaports, which act as sales agents for its publications, at the regular prices fixed by the Hydrographic Office.

APPENDIX I

OUTLINE OF ORGANIZATION

EXPLANATORY NOTE

The Outlines of Organization in this series of monographs have for their purpose to make known in detail the organization and personnel possessed by the several services of the national government to which they relate. They have been prepared in accordance with the plan followed by the President's Commission on Economy and Efficiency in the preparation of its outlines of the organization of the United States government.¹ They differ from those outlines, however, in that whereas the Commission's report showed only organization units, the presentation herein has been carried far enough to show the personnel embraced in each organization unit.

These outlines are of value not merely as an effective means of making known the organization of the several services. If kept revised to date by the services, they constitute exceedingly important tools of administration. They permit the directing personnel to see at a glance the organization and personnel at their disposition. They establish definitely the line of administrative authority and enable each employee to know his place in the system. They furnish the essential basis for making plans for determining costs by organization division and subdivision. They afford the data for a consideration of the problem of classifying and standardizing personnel and compensation. Collectively, they make it possible to determine the number and location of organization divisions of any particular kind as, for example, laboratories, libraries blueprint rooms, or any other kind of plant possessed by the national government, to what services they are attached and where they are located, or to determine what services are maintaining stations at any city or point in the United States. The Institute

¹ House Doc. 458, 62d Congress, 2d Session, 1912—2 vols.

hopes that upon the completion of the present series, it will be able to prepare a complete classified statement of the technical and other facilities at the disposal of the government. The present monographs will then furnish the details regarding the organization, equipment, and work of the institutions so listed and classified.

OUTLINE OF ORGANIZATION

HYDROGRAPHIC OFFICE

DEPARTMENT OF THE NAVY

APRIL 1, 1926

<i>Organization Units; Classes of Employees</i>	<i>Number</i>	<i>Annual Salary Rate</i>
1. Office of the Hydrographer		
Hydrographer (Captain)	1	*
2. Division of Administration		
1. Office of the Chief of Division		
Aid to Hydrographer, in charge (Com- mander)	1	*
2. Administration and Finance Section		
Chief of Section (Administrative Assis- tant)	1	\$3,000
Clerk-stenographer	1	1,860
	1	1,680
Stenographer	1	1,800
	1	1,440
Messenger	1	1,080
3. Files and Archives Section		
Chief of Section (Principal Clerk)	1	2,400
Clerk-stenographer	1	1,680
Clerk	1	1,500
	1	1,380
Messenger	1	1,080
4. Purchase and Supplies Section		
Clerk	1	1,860
3. Division of Maritime Security		
1. Office of the Chief of Division		
Chief of Division (Lieutenant Com- mander)	1	*
2. Nautical Data Section		
Clerk-stenographer	1	1,680
	2	1,560

* Pay and allowances of naval rank.

THE HYDROGRAPHIC OFFICE

3. Aerial Navigation Section		
Officer in charge (Lieutenant)	I	*
4. Light Lists Section		
Nautical Engineer, in charge	I	2,000
5. Notice to Mariners Section		
Nautical Engineer, in charge	I	3,800
	I	2,500
	I	2,000
Chief Engineering Aid (Translator)	I	2,400
Typist	I	1,560
Laborer	I	1,020
6. Pilot Charts Section		
Chief of Section, Nautical Engineer	I	3,800
	I	3,000
	I	2,000
Engineering Aide Nautical	2	1,740
Typist	I	1,560
Clerk	I	1,200
7. Route Information Section		
Officer in charge (Lieutenant Commander)	I	*
8. Sailing Directions Section		
Nautical Engineer, in charge	I	3,000
	I	2,500
	I	1,920
Engineering Aide Nautical	I	2,000
	I	1,920
4. Division of Nautical Research		
Senior Scientist, in charge	I	5,200
Scientist	I	3,800
5. Division of Chart Construction		
1. Office of Chief of Division		
Chief of Division (Commander)	I	*
Senior Engineer	I	5,200
Clerk-typist	I	1,560
Clerk-stenographer	I	1,380
2. Ocean and Lake Surveys Section ^b —Field Force		
Hydrographic Surveyor	I	3,700
	3	3,000
	I	2,700

* Pay and allowances of naval rank.

^b The Chief of Division and the Senior Engineer perform the office duties of this Section. See page 65.

OUTLINE OF ORGANIZATION

75

Junior Engineer	2	2,100
	2	1,860
Draftsman	1	1,500
3. Construction Section		
Chief of Section (Engineer)	1	3,800
Engineer	4	3,000
	3	2,500
Engineering Draftsman	1	2,000
Apprenice Engineering Draftsman	1	1,200
4. Compilation Section		
Chief of Section (Engineer)	1	3,800
Assistant Engineer	1	3,000
Engineering Draftsman	2	2,400
5. Reconstruction Section		
Chief of Section (Engineer)	1	3,800
Assistant Engineer	1	3,000
	2	2,400
6. Drafting Section		
Chief of Section (Engineer)	1	3,000
Engineer	1	2,500
Junior Engineer	2	1,860
Engineering Draftsman	2	2,400
	2	2,000
	1	1,800
	4	1,740
Apprentice Draftsman	1	1,200
Compositor	1	1,860
7. Engraving Section		
Chief of Section (Chief Engraver)	1	3,800
Senior Engraver	4	3,000
Engraver	1	2,500
	1	2,400
	1	2,100
	1	2,000
	1	1,920
	2	1,860
	1	1,680
	1	1,500
Engraving Machine Operator	2	1,320
Assistant Engraving Machine Operator	1	1,080
	1	900
8. Lithographic Section		
1. Office of the Chief Lithographer		
Chief Lithographer	1	3,000

THE HYDROGRAPHIC OFFICE

2. Subsection of Lithographic Drafting		
Lithographic Draftsman	2	2,400
	1	2,000
	1	1,860
	1	1,800
	2	1,740
Apprentice Lithographic Draftsman	2	1,020
3. Subsection of Photography		
Chief of Subsection (Photographer)	1	2,500
Photographer	1	1,860
Photographic Printer	1	1,800
	1	1,200
Negative Cutter	1	1,860
	2	1,740
	2	1,680
	1	1,620
4. Subsection of Lithographic Transfer		
Foreman Lithographic Transferrer	1	2,200
Lithographic Transferrer	3	1,860
	1	1,740
	1	1,560
5. Subsection of Lithographic Printing		
Foreman Pressman	1	2,400
Pressman	4	1,860
Electrotyper	1	1,620
Press-Feeder	2	1,560
Apprentice Press-Feeder	1	900
6. Subsection of Plate Printing		
Chief Plate Printer	1	2,100
Plate Printer	2	1,680
	1	1,500
	1	1,320
6. Division of Distribution		
1. Office of the Chief of Division		
Chief of Division (Lieutenant Commander)	1	^a
Nautical Engineer	1	2,500
2. Chart Stock Section		
Draftsman	1	2,500
	1	2,000
	1	1,680
	2	1,500
	1	1,440

^a Pay and allowances of naval rank.

OUTLINE OF ORGANIZATION

77

	3	1,380
	1	1,320
	1	1,140
3. Catalogue and Proof Reading Section		
Draftsman	1	2,500
Clerk	1	1,560
4. Issue Section		
Clerk-Stenographer	1	1,740
Clerk	1	1,320
Laborer	1	1,200
	2	1,080
	3	1,020
5. Mailing Lists Section		
Addressing Machine Operator	1	1,440
Laborer	1	1,080
	1	1,020
7. Branch Hydrographic Offices *		
1. Boston		
Officer in Charge (Lieutenant-Com-		
mander)	1	*
Stenographer-Typist	1	1,320
Clerk	1	1,260
2. New York		
Officer in Charge (Captain)	1	*
Clerk	1	1,500
Nautical Expert	1	1,440
Nautical Assistant	1	1,320
3. Philadelphia		
Officer in Charge (Captain)	1	*
Nautical Expert	1	1,680
4. Baltimore		
Officer in Charge (Lieutenant-Com-		
mander)	1	*
Nautical Expert	1	1,260
5. Norfolk		
Officer in Charge (Commander,		
Retired)	1	*
Messenger	1	1,140

* The Branch Hydrographic Office at Portland, Maine, established by law, is not operating at present. A Hydrographic Information Officer under the Commandant at Honolulu, H. I., and the Captains of the Ports at Panama and Cristobal, perform duties similar to those of officers in charge of a branch hydrographic office. Provision has been made for a Branch Hydrographic Office at Los Angeles, to be opened July 1, 1926, with a Lieutenant in charge, and a Nautical Assistant at a salary of \$1680 per annum.

* Pay and allowances of naval rank.

6. Savannah		
Officer in Charge (Lieutenant)	I	•
Clerk	I	1,260
7. New Orleans		
Officer in Charge (Lieutenant-Com- mander, Retired)	I	•
Assistant	I	1,380
8. San Francisco		
Officer in Charge (Commander)	I	•
Nautical Expert	I	2,400
	I	1,440
9. Portland (Oregon)		
Officer in Charge (Lieutenant)	I	•
Nautical Expert	I	1,140
10. Chicago		
Officer in Charge (Lieutenant)	I	•
Nautical Expert	I	1,440
11. Cleveland		
Officer in Charge (Lieutenant)	I	•
Clerk-Typist	I	1,440
12. Buffalo		
Officer in Charge (Lieutenant)	I	•
Messenger	I	1,140
13. Duluth		
Officer in Charge	I	•
Nautical Expert	I	3,000
Messenger	I	1,140
14. Sault Sainte Marie		
Officer in Charge (Lieutenant-Com- mander)	I	•
Clerk	I	1,320
15. Seattle		
Officer in Charge (Lieutenant-Com- mander)	I	•
Nautical Expert	I	1,440
16. San Juan (Porto Rico)		
Officer in Charge (Lieutenant Com- mander, Retired)	I	•
Nautical Expert	I	1,680
17. Galveston		
Officer in Charge (Lieutenant)	I	•
Nautical Expert	I	1,440

* Pay and allowances of naval rank.

APPENDIX 2

CLASSIFICATION OF ACTIVITIES

EXPLANATORY NOTE

The Classification of Activities have for their purpose to list and classify in all practicable detail the specific activities engaged in by the several services of the national government. Such statements are of value from a number of standpoints. They furnish, in the first place, the most effective showing that can be made in brief compass of the character of the work performed by the service to which they relate. Secondly, they lay the basis for system of accounting and reporting that will permit the showing of total expenditures classified according to activities. Finally, taken collectively, they make possible the preparation of a general or consolidated statement of the activities of the government as a whole. Such a statement will reveal in detail, not only what the government is doing, but the services in which the work is being performed. For example, one class of activities that would probably appear in such a classification is that of "scientific research." A subhead under this class would be "chemical research." Under this head would appear the specific lines of investigation under way and the services in which they were being prosecuted. It is hardly necessary to point out the value of such information in planning for future work and in considering the problem of the better distribution and coördination of the work of the government. The Institute contemplates attempting such a general listing and classification of the activities of the government upon the completion of the present series.

CLASSIFICATION OF ACTIVITIES

1. Hydrographic and Topographic Surveys in Foreign Waters and on the High Seas
2. Collection of Navigational Information
3. Preparation of Charts, Manuals, and other Nautical Publications
4. Dissemination of Navigation Information

APPENDIX 3

PUBLICATIONS

The publications of the Hydrographic Office consist of annual reports, hydrographic charts, special charts for naval vessels, Pilot Charts, Navigators, Manuals of Instruction, Sailing Directions or Pilots, Supplements to Sailing Directions, Light Lists (foreign countries), corrections to Light Lists, Radio Aids to Navigation and Supplements thereto, Notice to Mariners, Extract Notice to Mariners (Great Lakes), Hydrographic Bulletin, Daily Memorandum, Notice to Aviators, Mine Warnings, and a number of non-recurrent publications.

The Pilot Charts, Hydrographic Bulletins, Notices to Mariners, and reprints are distributed gratis to coöperating observers in exchange for services to the Hydrographic Office in the nature of reports of marine data for use in its publications. To others, the publications, with few exceptions, are sold at cost of publication.

Distribution is made by mail and by personal delivery at the Hydrographic Office, the branch hydrographic offices, authorized sales agencies in this country and abroad, American Consular Offices at leading seaports abroad, and certain other public offices. Publications may be obtained by purchase from the Hydrographic Office or from its sales agencies, but not from the branch hydrographic offices or from the Superintendent of Documents.

Authority for these publications is contained in Section 78 of the act of January 12, 1895 (28 Stat. L., 621),¹ which is a re-enactment of Section 2 of the act of June 21, 1866 (14 Stat. L., 69; R. S. 432). The money received from the sale of these publications is covered into the Treasury of the United States as miscellaneous receipts (Act of May 29, 1920; 41 Stat. L., 665).

Accounts of earlier publications of the Hydrographic Office and its predecessor are given in the history chapter.

¹ See page 91.

Annual Reports. Annual Reports of the Hydrographic Office have been issued with a few omissions since 1869. From 1869 to 1905 these reports have appeared only as part of the annual reports of the Navy Department, except the report for 1902 which appeared in the annual report of the Equipment Bureau for that year. From 1881 to 1905 the Annual Reports of the Hydrographic Office have usually been issued in separate form also. In 1906 a condensed report was issued separately only, but was summarized in the annual report of the Navy Department for that year. From 1907 to 1911, no regular signed annual reports were printed, the work of the Hydrographic Office being summarized in annual reports of the Navigation Bureau and of the Navy Department. From 1912 to date, Annual Reports of the Hydrographic Office have been issued (except 1921), in separate form, as appendices to the annual reports of the Chief of the Bureau of Navigation and as parts of the annual reports of the Navy Department.

Hydrographic Charts. The Office had on issue in 1925, 2611 individual Hydrographic Office chart plates. Of these charts, 345 are constructed from its own surveys, the others being reproductions of charts of foreign countries after necessary changes and corrections have been made on them.

Some of these charts cover an entire region, while others, on a larger scale, cover smaller areas and are more detailed. The general coast charts of the globe are being constructed on a uniform scale of $4\frac{1}{2}$ inches to the degree of longitude on the Equator. Special coast charts are constructed on a scale of one-fourth inch to the minute of middle latitude of each chart. Local and harbor charts of foreign countries are on a large scale varying according to the available data and the characteristics of the locality, from one to ten inches to the nautical mile.

A series of general ocean charts covering all the oceanic world, excepting the polar regions, constructed on uniform scale of six-tenths of an inch to the degree of longitude on the Equator, was completed some years ago, and these as well as all the other charts published by the Hydrographic Office are kept corrected for the issue of new editions at short periods.

The general and special coast charts delineate the coasts of all countries, and for each coast are consecutive, and take in such sections of the coast as will permit the use of a comparatively large

scale. These charts accurately show the coast line; the principal topographic features which can be used in navigation; all the light-houses with their peculiar characteristics; the life-saving stations, and all the features which can enable an observer to determine his position. The soundings are frequent and in general are run out to the 100-fathom curve.

The harbor chart is on a larger scale and in greater detail than the others. Every object on shore that can be used in piloting a vessel in or out of the harbor is shown in its correct position. Where possible, ranges to guide vessels in and out are determined and plotted upon the chart, as are lighthouses, range lights, buoys, beacons, and all day marks, the positions of landing places, custom houses, quarantines and public buildings of which the navigator may have occasion to know. Curves of certain equal depths of water are indicated and the magnetic declination or variation is noted.

The general ocean charts cover large tracts and are principally for the use of navigators in the open sea, as in making long voyages. These charts are on a small scale. They show the character of the ocean bed as delineated by deep-sea soundings obtained by vessels of the principal maritime nations; the shore lines with the most prominent topographic features, the principal seaports, the light-houses, etc., which are of use in off-shore navigation; all dangers in the nature of shoals, reefs, and rocks; the lines of equal magnetic declination or variation; and compass stars, showing both true and magnetic directions. These charts are designed to enable the navigator to keep as nearly as possible a direct course to his port of destination. This chart is replaced by the coast chart when the vessel gets within the coast limits.

World charts showing the lines of equal declination and inclination of the magnetic needle and the intensity of the earth's magnetic force have been constructed, and these have been supplemented by publication of the results of the analytical treatment and the magnetic observations made in many parts of the world.

Other world charts constructed by the Hydrographic Office show the telegraphic connections of the world, and the tracks for full-powered steamers with the shortest distances in nautical miles.

In the fiscal year 1925, 297,607 charts were printed, and 263,257 were issued for distribution. They are furnished free to naval

vessels for official use. Others are sold at the Hydrographic Office in Washington and at its authorized agencies in the principal American and foreign seaports and American lake ports. The prices charged for these charts vary with the size and cost of publication, being based upon the actual cost of paper and printing, or an average of about forty cents each. A general catalogue of charts and books is issued by the Hydrographic Office.

In addition to the navigational charts for general distribution, the Hydrographic Office issues charts for the special use of vessels of the United States Navy, some of which are strictly secret and confidential.

Pilot Charts. These charts have been regularly published by the Hydrographic Office since 1883, although they were originally developed before 1855 by Lieutenant Maury. There are six of these charts issued periodically, each chart relating to one of six geographical divisions of the globe, namely, for the North Atlantic Ocean, the North Pacific Ocean, the Indian Ocean, and the Central American waters, which are issued monthly; and for the South Atlantic Ocean and the South Pacific Ocean, which are issued quarterly.

The Pilot Charts show graphically such navigational features and meteorological and other physical phenomena of the sea, as will tend, by their use, to safeguard the lives of seamen and accelerate transit from place to place.

The data graphically shown on these charts cover the regions of storm, fog, and floating ice; the set and rate of ocean currents; the average direction and force of the winds to be expected; tradewind limits; the best passage routes; the normal isobaric and isothermal lines; the variations of the compass and its change with time and locality; the reported positions of derelict vessels and floating obstructions to navigation; explanations of the United States storm warning signals and other chart data; notices of Hydrographic Office publications; and lists and other information concerning branch hydrographic offices and radiocompass stations.

As the data for these charts are chiefly obtained from regular voluntary reports of mariners throughout the world, the Pilot Charts are distributed free to all of these coöperative reporters. They thus constitute an essential link between the Hydrographic

Office and the shipmasters of all nations, which enables that Office to obtain constant prompt information for use not only in the preparation of these charts but also of other navigational charts and books which the Hydrographic Office is required to prepare and keep corrected to date.

The Pilot Charts are printed on single sheets of heavy paper, 26" x 38" in dimension. During the fiscal year 1925, 187,500 copies of Pilot Charts were distributed. They are furnished free to coöperating mariners, and are sold at a uniform price of ten cents each to others.

Sailing Directions or Pilots. The Sailing Directions are the nautical guidebooks of mariners. These guidebooks, when used in connection with the corresponding navigational charts and corrected to date in accordance with the current publications of the Office, will give the mariner all the information that he may require for safe navigation. They contain descriptions of coast lines, and harbors; information concerning the prevailing weather and winds for each season; currents and tides; buoys, lights, and other day and night marks; proper anchorages; description of ranges to be used in entering and leaving port, both by day and at night; prominent landmarks and other topographical features, in detail; information in regard to pilotage and quarantine, local regulations of foreign governments and diplomatic customs of the local and state authorities affecting navigation, the facilities for obtaining provisions, water, and other supplies, and for making necessary repairs; and much other information of value to mariners.

The Hydrographic Office has issued fifty-eight such volumes for as many different geographical divisions, which, together with the fifteen volumes of Sailing Directions issued by the Coast and Geodetic Survey of the Department of Commerce cover all the navigable waters of the globe. They are printed in octavo form and contain several hundred pages each of printed matter. They are revised at intervals varying from four to ten years. During the fiscal year 1925, 9473 copies of Sailing Directions of the Hydrographic Office were distributed, about one-third of which were sold. Copies of the Sailing Directions or Pilots are on sale at the Hydrographic Office and at the authorized agencies at the uniform price of ninety cents each.

Supplements to Sailing Directions. At the first international hydrographic conference an agreement was made that each country should publish annual supplements to the Sailing Directions, a practice which the Hydrographic Office had followed for many years. As the Sailing Directions are revised at long, irregular intervals, correctional supplements containing more recent information are issued in February or March of each year, bringing the data up to the first of that year. These supplements are issued in pamphlet form in the same fifty-eight series as the Sailing Directions, one for each of the latter. As they are issued with the view of having the items cut and pasted into the volumes of the Sailing Directions, they are printed on one side only. They are sent out to all mariners who hold copies of the Sailing Directions to which they apply, and to the branch hydrographic offices and agencies.

List of Lights. Six of the volumes of Light Lists, which appear in octavo form, are issued once each year, one for each foreign division of the globe. Lists covering lights along the coasts of the United States are published by the Bureau of Lighthouses of the Department of Commerce.

The Light Lists show all lighted navigational aids, except harbor buoys, on the coasts covered by each volume; also fog signals, storm signals, and signal stations located at or near the lights. The geographical positions of the lights are ascertained from the most reliable sources available.

Changes affecting these lights and stations are published in the weekly Notice to Mariners in such form that they can be cut and pasted in the volumes of Lists of Lights.

In the fiscal year 1925, 3198 copies of the List of Lights of the Hydrographic Office were distributed, about half of which were sold. The uniform price is sixty cents per copy.

Radio Aids to Navigation. The publication, Radio Aids to Navigation, appeared for the first time in 1925. It contains a complete list of the radio compass stations and of radio stations throughout the world which transmit fog signals, weather bulletins, storm and navigational warnings, and time signals. Some of the data were previously published in the List of Lights. The book will probably be reprinted every two years, but supplements will be issued every six months.

Notice to Mariners. The Notice to Mariners is the most important of the periodical publications of the Hydrographic Office. It appears weekly in octavo form and brings to date all important nautical information needed for the correction of charts, Sailing Directions, and Light Lists. The weekly issues have been continuous since 1869.

The current information contained in these weekly pamphlets includes notices of changes in aids to navigation, such as lights, buoyage, and harbor construction; dangers to navigation, such as rocks, shoals, banks and bars; important new soundings; and in general, all such information as affects mariners charts, manuals, and Sailing Directions. It indicates the charts and books to be corrected, and the pages of the books where the corrections are to be made.

For convenient use for cutting and pasting, the correctional items in the pamphlets are printed on one side only. On an average, about five thousand such items appear annually. The items relating to lights are printed on a separate sheet which accompanies each copy of the Notice to Mariners.

Information is also given in the Notice to Mariners concerning the nature and prices of books and charts published and distributed by the Hydrographic Office, and the location of branch hydrographic offices and authorized agencies for the sale of Hydrographic Office publications.

From five thousand to six thousand copies of the Notice to Mariners are issued each week (on Saturday), the total issue during the fiscal year 1925 having been 283,400 copies. They are mailed to all United States vessels in commission, to scientific societies, to branch offices, to authorized sales agencies, and to United States consulates abroad. They are furnished free on application.

Hydrographic Bulletin. The Hydrographic Bulletin appears weekly (on Fridays) in the form of a single sheet, about 24" x 26" in dimension. It contains the latest reports of obstructions and dangers along the coasts and principal ocean routes and other information of interest to mariners, including reports of wrecks, and derelicts, and ice; items on port facilities; lists of branch hydrographic offices, and of sales agencies for publications, a statement of the price and correctness of the publications; instructions for

utilizing the radio in the transmission of reports to the Hydrographic Office, for reporting derelicts and vessels in distress, and for the transmission of weather reports; and other current information of interest to navigators relating to the Hydrographic Office and its functions.

About five thousand copies of the Bulletin are distributed gratis each week, largely to persons and institutions which coöperate with the Hydrographic Office by supplying information. During the fiscal year 1925, 217,100 copies of the Bulletin were distributed.

Ice Supplement to the Hydrographic Bulletin. The Ice Supplement to the Hydrographic Bulletin is a small chart, $13\frac{1}{2}'' \times 10\frac{1}{4}''$, which presents geographically, all late reports concerning floating ice. It is issued weekly during the season of dangerous ice with the Hydrographic Bulletin. It shows the trans-Atlantic steamer lanes, the ice to be encountered, etc. The Coast Guard of the Treasury Department maintains an ice patrol annually from March to July, transmitting information concerning the presence of ice to the Hydrographic Office, which disseminates it by this means and by radio to the rest of the world.

Daily Memorandum. The Daily Memorandum, which appears in mimeograph form, daily (except Sundays and holidays), gives prompt notice to all within reach, of the most important navigational changes and other occurrences which affect safe navigation, such as the location of ice-bergs, derelicts, and other obstructions; and other similar information. The most urgent of these items are broadcasted by radio. The publication is intended as a supplement to the Hydrographic Bulletin.

The information contained in the Memorandum is obtained by radio messages from vessels at sea and by mail and telegraph from vessels arriving in port; from private shipping companies, from foreign governments, from superintendents of lighthouses; from branch hydrographic offices, and from other sources.

The Daily Memorandum usually covers four or five pages of mimeographed matter on $8'' \times 14''$ sheets. It is mailed, gratis, to about 540 persons and institutions, including large steamship companies, the branch hydrographic offices, engineering offices, and some government bureaus. During the fiscal year 1925, 151,164 copies were distributed.

Notice to Aviators. The Notice to Aviators is a monthly publication giving information of service to aviators in the navigation

of air, including the location of air harbors and air routes, the establishment and maintenance of aids to the navigation of the air, scientific articles on the development of aerial navigation, and other similar information. The distribution in the fiscal year 1925 was 12,000 copies.

Mine Warnings. The Mine Warnings contains notices of mine fields, supplemented, as necessary, by charts defining mine areas. It is published at irregular intervals whenever information is received from the International Mine Clearance Committee at London. These warnings are also sent out to mariners by means of radio and otherwise. Fifteen hundred copies were distributed in the fiscal year 1925.

Manuals, Tables, and Special Charts. In addition to the charts and other periodical publications issued to aid navigation, the Hydrographic Office publishes manuals, tables, and epitomes of navigation for the Navy and the mercantile marine generally.

The American Practical Navigator, is an epitome of navigation and nautical astronomy. It was originally published by Nathaniel Bowditch, but has been altered and revised and reedited from time to time. The latest edition, of 835 pages, was published in 1925. It conforms to the American Ephemeris and Nautical Almanac for 1925, in which, in the tabulation of the ephemerides of the celestial bodies, the hours of the day are counted from midnight to midnight of the civil day instead of from noon to noon of the astronomical day as heretofore, and the time is designated civil time instead of mean time. The Hydrographic Office is the only government office which is required by law to issue this publication.

Related manuals and charts indispensable to navigation, which are published and continually issued by the Hydrographic Office, are: Solar Azimuth Tables ranging in declination from 23° N. to 23° S.; Azimuths of Celestial Bodies ranging in declination from 24° to 70° from the celestial equator; Star Identification Tables; Altitude, Azimuth, and Line of Position Tables; Simultaneous Altitudes and Azimuths of Celestial Bodies; Noon Interval Tables; International Code of Signals; Development of Great Circle Sailing; Tables of Distances; and General Catalogue of Mariners' Charts and Books published by the Hydrographic Office.

Among the most recent of the important manuals are Hydrographic Publications Nos. 203 and 204, entitled respectively, "The

Sumner Line of Position, furnished ready to lay down upon the chart by means of tables of simultaneous hour angle and azimuth of celestial bodies of declination ranging from 27° N. to 27° S. of the celestial equator," and "The Sumner Line of Position, furnished ready to lay down upon the chart by means of tables of simultaneous hour angles and azimuth of the navigator's stars ranging in declination from 27° to 63° north and south of the celestial equator." These works present a new and shorter method than heretofore devised for finding positions at sea for navigators. By their use one can find a line of position within three minutes' time, without making any logarithmic computations. They are published in octavo form and together contain 1600 pages.

APPENDIX 4

LAWS

(A) INDEX TO LAWS

Appropriations

- For foreign hydrographic charts.....28 Stat. L., 601, 621
- For the fiscal year 1926.....Pub. No. 264, 69th Cong.
- For the International Hydrographic Bureau.....Pub. No. 156, 69th Cong.

Duties and Powers

- Foreign hydrographic surveys.....28 Stat. L., 601, 621
- Functions of the Hydrographic Office.....14 Stat. L., 69
- Meteorological information to be obtained from Weather Bureau36 Stat. L., 468, 508
- Ocean and lake surveys, appropriation for.....Pub. No. 264, 69th Cong.

Organization

- Branch hydrographic offices, establishment of.....23 Stat. L., 159, 184
- Hydrographic Office attached to Bureau of Navigation.....14 Stat. L., 69

Publications

- Authority for preparation and distribution of.....28 Stat. L., 601, 621, 623
- Charts, etc., to be sold at cost.....20 Stat. L., 284, 286
31 Stat. L., 1133, 1187
- Estimates and appropriations for publication to be separate for Hydrographic Office.....24 Stat. L., 222, 255
- Plates and copyrights, purchase of.....28 Stat. L., 601, 621
- Receipts from sales, disposition of.....28 Stat. L., 601, 621
41 Stat. L., 631, 665
- Source of data to be printed on Pilot Charts.....36 Stat. L., 468, 508

(B) COMPILATION OF LAWS

1866—Act of June 21, 1866 (14 Stat. L., 69)—An Act to establish a Hydrographic Office in the Navy Department.

[SECTION 1]. There shall be a Hydrographic Office attached to the Bureau of Navigation¹ in the Navy Department, for the improvement of

¹ An act of May 4, 1898 (30 Stat. L., 374), transferred the Hydrographic Office to the Bureau of Equipment of the Navy Department. The naval appropriation acts for the fiscal years 1912, 1913, and 1914 provided for the distribution of the duties, funds, and employees of the Bureau of Equipment among the other bureaus and offices of the Navy Department, and the act of June 30, 1914 (38 Stat. L., 408), abolished that bureau. Pursuant to these statutes the Hydrographic Office again was attached to the Bureau of Navigation, by Navy Regulations and has since remained there.

the means for navigating safely the vessels of the Navy and of the mercantile marine, by providing under the authority of the Secretary of the Navy, accurate and cheap nautical charts, sailing directions, navigators, and manuals of instructions, for the use of all vessels of the United States, and for the benefit and use of navigators generally.²

1879—Act of February 14, 1879 (20 Stat. L., 284, 286)—An act making appropriations for the naval service for the year ending June thirtieth, eighteen hundred and eighty, and for other purposes, as amended May 29, 1920 (41 Stat. L., 661, 665).

. . . That all charts hereafter furnished to mariners or others not in the government service shall be paid for at the cost price of paper and printing paid by the government.

1884—Act of July 7, 1884 (23 Stat. L., 159, 184)—An act making appropriation for the legislative, executive, and judicial expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-five, and for other purposes.

. . . Contingent expenses of branch offices at Boston, New York, Philadelphia, Baltimore, New Orleans, and San Francisco . . .³

1886—Act of August 4, 1886 (24 Stat. L., 222, 255)—An act making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-seven, and for other purposes.

. . . That all printing and engraving for the . . . Hydrographic Office of the Navy Department . . . shall hereafter be estimated for separately and in detail, and appropriated for separately.

1895—Act of January 12, 1895 (28 Stat. L., 601, 621, 623)—An Act Providing for the public printing and binding and the distribution of public documents, as amended by act of May 29, 1920 (41 Stat. L., 631, 665).

* * * *

SEC. 77. The Secretary of the Navy is authorized to cause to be prepared at the Hydrographic Office attached to the Bureau of Navigation,

² Section 2 was repeated, and Section 3 was replaced by the first and second paragraphs, respectively, of Section 77 of the act of January 12, 1895

³ Provision for additional branch offices has been made in subsequent appropriation acts.

in the Navy Department, maps, charts, and nautical books relating to and required in navigation, and to publish and furnish them to navigators at the cost of printing and paper, and to purchase the plates and copyrights of such existing maps, charts, navigators' sailing directions and instructions as he may consider necessary, and when he may deem it expedient to do so, and under such regulations and instructions as he may prescribe.

[As amended]: All sums received from the sale of maps, charts, and other publications issued by the Hydrographic Office after June 30, 1921, shall be covered into the Treasury of the United States as miscellaneous receipts.

SEC. 78. All appropriations made for the preparation or publication of foreign hydrographic surveys shall only be applicable to their object, upon the approval by the Secretary of the Navy, after a report from three competent naval officers to the effect that the original data for proposed charts are such as to justify their publication; and it is hereby made the duty of the Secretary of the Navy to order a board of three naval officers to examine and report upon the data before he shall approve of any application of moneys to the preparation or publication of such charts, or hydrographic surveys.

SEC. 89. . . . the Secretary of the Navy may authorize the printing of the charts, maps, notices to mariners, tide tables, light lists, sailing directions, bulletins, and other special publications of the Hydrographic Office in such editions as the interests of the Government and of the public may require. . . .

1901—Act of March 3, 1901 (31 Stat. L., 1133, 1187)—An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and two, and for other purposes.

. . . For publication of the International Code of Signals and copies of said International Code of Signals may be sold to the public at cost of printing, including cost of composition, presswork, folding, paper, binding, engraving and electrotyping.

1910—Act of June 17, 1910 (36 Stat. L., 468, 508)—An Act Making appropriations for the legislative, executive, and judicial expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and eleven, and for other purposes.

. . . Hereafter the pilot charts prepared in the Hydrographic Office shall have conspicuously printed thereon the following: "Prepared from data furnished by the Hydrographic Office of the Navy Department and by the Weather Bureau of the Department of Agriculture, and published at the Hydrographic Office under the authority of the Secretary of the Navy;" and all meteorological information received by the Weather Bureau of the Department of Agriculture necessary for and of the character of such information heretofore used in the preparation of the pilot charts shall

continue to be furnished with all possible expedition to the Hydrographic Office for use in the preparation of said charts. . . .

1925—Act of May 21, 1926 (Public No. 264, 69th Cong.)—An Act Making appropriations for the Navy Department and the naval service for the fiscal year ending June 30, 1927, and for other purposes.

* * * *

OFFICE OF THE SECRETARY

Printing and Binding

* * * *

. . . For printing and binding . . . not exceeding \$85,000 for the Hydrographic Office.

BUREAU OF NAVIGATION

Ocean and Lake Surveys, Bureau of Navigation

For hydrographic surveys, including the pay of the necessary hydrographic surveyors, cartographic draftsmen, and recorders, and for the purchase of nautical books, charts, and sailing directions, \$85,000.

HYDROGRAPHIC OFFICE

Salaries, Hydrographic Office

Salaries, Navy Department: For personal services in the District of Columbia, in accordance with the Classification Act of 1923, \$310,000.

Contingent and Miscellaneous Expenses, Hydrographic Office

For purchase and printing of nautical books, charts, and sailing directions, copperplates, steel plates, chart paper, packing boxes, chart portfolios, electrotyping copperplates, cleaning copperplates; tools, instruments, power, and materials for drawing, engraving, and printing; materials for and mounting charts; reduction of charts by photography; photolithographing charts for immediate use; transfer of photolithographic and other charts to copper; purchase of equipment for the storage of plates used in making charts and for the storage of Hydrographic Office charts and publications; purchase of one new offset press; modernization, care and repairs to printing presses, furniture, instruments, and tools; extra drawing and engraving; translating from foreign languages; telegrams on public business; preparation of pilot charts and their supplements, and printing and mailing same; purchase of data for charts and sailing directions and other nautical publications; books of reference and works and periodicals relating to hydrography, marine meteorology, navigation surveying, oceanography, and terrestrial magnetism, and to other professional and technical subjects connected with the work of the Hydrographic Office \$68,800.

For contingent expenses of branch hydrographic offices at Boston, New York, Philadelphia, Baltimore, Norfolk, Savannah, New Orleans, San

Francisco, Portland (Oregon), Portland (Maine), Chicago, Cleveland, Buffalo, Duluth, Sault Sainte Marie, Seattle, Panama, San Juan (Porto Rico), Los Angeles and Galveston, including furniture, fuel, lights, works, and periodicals relating to hydrography, marine meteorology, navigation, surveying, oceanography, and terrestrial magnetism, stationery, miscellaneous articles, rent and care of offices, care of time balls, car fare and ferriage in visiting merchant vessels, freight and express charges, telegrams, and other necessary expenses incurred in collecting the latest information for pilot charts, and for other purposes for which the offices were established, \$13,620.

For services of necessary employees at branch offices, \$35,000.

1925—Act of April 29, 1906 (Public No. 156, 69th Cong.)—An Act Making appropriations for the Department of State and Justice and for the Judiciary and for the Departments of Commerce and Labor, for the fiscal year ending June 30, 1926, and for other purposes.

TITLE I.—DEPARTMENT OF STATE

* * * *

. . . For the annual contribution of the United States toward the maintenance of the International Hydrographic Bureau, \$5,790.

APPENDIX 5

FINANCIAL STATEMENT

EXPLANATORY NOTE

Statements showing appropriations, receipts, expenditures and other financial data for a series of years constitute the most effective single means of exhibiting the growth and development of a service. Due to the fact that Congress has adopted no uniform plan of appropriation for the several services and that the latter employ no uniform plan in respect to the recording and reporting of their receipts and expenditures, it is impossible to present data of this character according to any standard scheme of presentation. In the case of some services the administrative reports contain tables showing financial conditions and operations of the service in considerable detail; in others financial data are almost wholly lacking. Careful study has in all cases been made of such data as are available, and the effort has been made to present the results in such a form as will exhibit the financial operations of the services in the most effective way that circumstances permit.

The appropriations included in this financial statement comprise not only those made directly for the Hydrographic Office and the branch hydrographic offices, but also appropriations for "ocean and lake surveys" for the Bureau of Navigation, and allotments to the Hydrographic Office from appropriations for "contingent expenses" and "additional employees" for the Navy Department.

It was not until August 5, 1882 (22 Stat. L., 219, 245), that any mention was made of the Hydrographic Office in the appropriation acts. Although it had been established as a separate office since 1866, the expenditures for the Office until after this act were made out of appropriations for the Bureau of Navigation, and, for a short period, for the Bureau of Equipment, to each of which the Office was in turn attached.

The act of 1882 had two items relating to the Hydrographic Office personnel with appropriations amounting to \$38,940, and

two items relating to supplies aggregating \$24,000. Since then annual appropriations have been made specifically for the Hydrographic Office.

An act of July 7, 1884 (23 Stat. L., 159, 184), made an appropriation of \$5000 for contingent expenses of certain designated branch offices, which item has been continued to the present time.

An act of August 4, 1886 (24 Stat. L., 222, 255), provided that "all printing and engraving for the . . . Hydrographic Office of the Navy Department . . . shall hereafter be estimated for separately and in detail, and appropriated for separately." Accordingly, beginning with the act of October 2, 1888 (25 Stat. L., 505, 547), appropriation has been made each year specifically for printing and binding for the Hydrographic Office.

Provision for "ocean and lake surveys" was first made in the act of September 7, 1888 (25 Stat. L., 458, 459), which appropriated \$5000 "For special ocean surveys and the publication thereof." It was repeated the following year in the act making appropriations for the fiscal year ending 1890. An act of July 19, 1892 (27 Stat. L., 236, 237), making appropriations for 1893 appropriated \$14,000 "For ocean and lake surveys," etc. This appropriation has since been made annually, the amount having been materially increased.

Appropriation for "a monthly Pilot Chart of the North Pacific Ocean" was made for the first time by the act of July 31, 1894 (28 Stat. L., 162, 190) It was discontinued as a separate item of appropriation after the fiscal year 1915.

An appropriation for "necessary employees at branch offices" was made in an act of February 26, 1907 (34 Stat. L., 935, 970), for the fiscal year 1908, and has been continued annually to the present time.

Until the end of the fiscal year 1921 the financial statement includes receipts from sales, because these receipts were expendable by the Hydrographic Office. The act of May 29, 1920 (41 Stat. L., 631, 665), provided, for the first time, that "all sums received from the sale of maps, charts, and other publications issued by the Hydrographic Office after June 30, 1921, shall be covered into the Treasury of the United States as miscellaneous receipts," and since that time these receipts have not been carried in the financial statement. The receipts from sales since that time

were: 1922, \$32,693.61; 1923, \$25,640.66; 1924, \$27,981.32; 1925, \$24,447.48.

The figures of expenditures are on an accrual basis except where otherwise indicated.

The items relating to salaries in the financial statements do not include the salaries and allowances of the twenty-five commissioned naval officers detailed for service in the Hydrographic Office and in the branch offices, who are paid out of the appropriations for "pay of the Navy."

THE HYDROGRAPHIC OFFICE

HYDROGRAPHIC OFFICE
APPROPRIATIONS, FISCAL YEARS BY FIVE-YEAR INTERVALS, 1885 TO 1910, INCLUSIVE

	1885 Appropriation	1890 Appropriation	1895 Appropriation	1900 Appropriation	1905 Appropriation	1910 Appropriation
Salaries, Hydrographic Office.....	\$45,140	\$45,440	\$45,440	\$45,440	\$101,000	\$102,200
Contingent and miscellaneous expenditures:						
Hydrographic Office	25,400	31,500	31,500	36,500	7,000	7,000
Branch Hydrographic Offices	5,000	12,000	17,000	25,000	30,500	11,000
Employees, branch hydrographic offices.....	.....	.....	.....	.....	.....	17,960
Total	30,400	43,500	48,500	61,500	37,500	35,960
Receipts from Sales.....	.....	.....	.....	.....	.....	\$6,184.04
Allotment, Navy Department.....	.....	.....	.....	.....	.....	140
Pilot charts, North Pacific Ocean.....	.....	.....	10,000	10,000	2,000	2,000
Ocean and lake surveys.....	.....	610,000	14,000	100,000	75,000	57,000
Public printing and binding.....	.....	17,000	12,000	12,000	15,000	25,000
Total	\$75,540	\$115,940	\$129,940	\$208,940	\$210,500	\$229,384.04

* Figures for preceding years were not available.
 b Appropriation made for "special ocean surveys," Bureau of Navigation.
 c Includes appropriation of \$5,000 for publication of surveys of Mexican and other coasts.

FINANCIAL STATEMENT

99

APPROPRIATIONS AND EXPENDITURES, FISCAL YEARS 1911 TO 1926, INCLUSIVE—Continued

	1911		1912		1913		1914	
	Appropriation	Expenditure	Appropriation	Expenditure	Appropriation	Expenditure	Appropriation	Expenditure
Salaries, Hydrographic Office.	\$102,200.00	\$100,650.94	\$102,500.00	\$100,083.61	\$120,233.12	\$114,279.57	\$123,460.00	\$120,797.46
Contingent and miscellaneous expenditures: ^a								
Hydrographic Office ..	7,000.00	.....	11,700.00	.....	36,440.00	.....	38,500.00	.....
Branch hydrographic offices.	11,000.00	.....	11,000.00	.....	11,000.00	.....	11,000.00	.....
Employees, branch hydrographic offices.	17,960.00	.....	17,960.00	.....	17,960.00	.....	17,960.00	.....
Total	35,960.00	32,269.88	40,660.00	37,504.02	65,400.00	49,361.59	67,460.00	64,147.04
Receipts from sales ^b.....	.....	.....	7,287.12	7,287.12	8,355.08	8,355.08	7,120.14	7,120.14
Allotment, Navy Department ^b.....	.....	.....	150.00	140.81	177.00	175.58	310.00	307.23
Pilot charts, North Pacific Ocean.	2,000.00	1,982.83	2,000.00	1,941.90	2,000.00	1,506.42	2,000.00	1,902.63
Ocean and lake surveys.	75,000.00	68,401.19	75,000.00	73,934.01	75,000.00	65,954.32	90,000.00	85,638.08
Public printing and binding.	25,000.00	23,815.39	25,000.00	24,341.60	25,000.00	21,227.73	33,000.00	32,350.97
Total	\$240,160.00	\$227,140.21	\$252,597.12	\$245,233.07	\$296,165.20	\$262,860.29	\$323,350.14	\$312,263.54

^a Itemized figures of expenditures on an accrual basis are not available.^b Figures obtained from annual reports and records of the Hydrographic Office. Expenditures are not on an accrual basis.

THE HYDROGRAPHIC OFFICE

APPROPRIATIONS AND EXPENDITURES, FISCAL YEARS 1911 TO 1926, INCLUSIVE—Continued

	1915		1916		1917		1918	
	Appropriation	Expenditure	Appropriation	Expenditure	Appropriation	Expenditure	Appropriation	Expenditure
Salaries, Hydrographic Office	\$123,651.67	\$122,861.99	\$123,660.00	\$122,353.68	\$123,660.00	\$121,033.12	\$124,030.00	\$111,572.76
Salaries additional employees, ^a	.....	.....	.....	.....	\$50,000.00	500.86	.....	44,904.62
Increase of compensation	.....	.....	.....	.....	.....	.....	8,159.35	8,159.35
Contingent and miscellaneous expenditures: ^b								
Hydrographic Office ..	26,000.00	.....	26,000.00	.....	56,000.00	.....	80,000.00	.....
Branch hydrographic offices.	11,000.00	.....	10,000.00	.....	10,000.00	.....	10,000.00	.....
Employees, branch hydrographic offices.	17,960.00	.....	17,960.00	.....	17,960.00	.....	17,960.00	.....
Total	54,960.00	51,512.57	53,960.00	52,305.35	83,960.00	80,248.25	107,960.00	77,597.75
Receipts from sales ^c ...	10,188.74	10,188.74	13,307.70	13,307.70	23,256.00	23,256.00	61,622.15	61,622.15
Allotment, Navy Department, ^d	973.18	972.49	150.00	115.39	500.00	843.11	1,100.00	937.25
Pilot charts, North Pacific Ocean.	2,000.00	1,722.78	.....	.....	.....	.....	.....	.....
Ocean and lake surveys.	90,000.00	80,404.55	105,000.00	92,079.10	419,486.67	190,409.66	.....	.....
Public printing and binding. ^e	25,000.00	24,998.64	25,000.00	23,245.07	40,000.00	26,405.85	50,000.00	*50,542.41
Total	\$306,773.59	\$292,661.66	\$321,077.70	\$301,406.20	\$511,862.67	\$442,666.79	\$382,861.50	\$355,336.20

^a Itemized figures of expenditures on an accrual basis are not available.^b Figures obtained from annual reports and records of the Hydrographic Office. Expenditures are not on an accrual basis.^c Appropriation available for fiscal years 1917 and 1918.^d Exclusive of \$60,513.33 transferred to the appropriation for 1919; appropriation available for fiscal years 1917 and 1918.^e Includes expenditures out of an allotment from an appropriation for public printing and binding, Navy Department, available for fiscal years 1917 and 1918.

FINANCIAL STATEMENT

101

APPROPRIATIONS AND EXPENDITURES, FISCAL YEARS 1911 TO 1926, INCLUSIVE—Continued

	1919		1920		1921		1922	
	Appropriation	Expenditure	Appropriation	Expenditure	Appropriation	Expenditure	Appropriation	Expenditure
Salaries, Hydrographic office.	\$124,020.00	\$97,935.47	\$124,020.00	\$101,585.66	\$120,760.00	\$106,432.58	\$120,760.00	\$111,433.99
Salaries, additional temporary employees. ^a	66,642.34	66,643.04	67,188.57	107,168.28	100,000.00	97,153.34	110,000.00	119,401.60
Increase of compensation	14,730.01	14,730.01	40,145.00	40,445.00	35,630.85	35,630.85	43,921.98	43,921.98
Contingent and miscellaneous expenditures: ^c								
Hydrographic Office ...	90,000.00	.....	50,000.00	.....	50,000.00	.....	112,000.00	.....
Branch hydrographic offices.	12,500.00	.....	12,500.00	.....	15,000.00	.....	15,000.00	.....
Employees, branch hydrographic offices.	17,966.00	.....	17,966.00	.....	25,000.00	.....	25,000.00	.....
Total	412,047.85	76,315.58	480,461.49	.....	300,000.00	82,468.77	152,000.00	116,288.68
Receipts from sales ^a	77,866.68	77,866.68	1,084,474.93	1,060,084.46	61,401.44	61,401.44	.....	.....
Allotment, Navy Department. ^a	1,000.00	817.15	500.00	481.64	636.18	636.18	400.00	400.00
Ocean and lake surveys..	224,662.91	199,918.14	155,000.00	124,496.38	100,000.00	70,990.97	100,000.00	100,000.00
Public printing and binding.	50,000.00	39,408.26	50,000.00	47,220.48	50,000.00	47,370.12	50,000.00	50,000.00
Total	\$679,249.21	\$172,871.01	\$666,089.99	\$557,481.90	\$563,418.47	\$502,071.05	\$567,081.98	\$581,386.91

^a Figures obtained from annual reports and records of the Hydrographic Office. Expenditures are not on an accrual basis.

^b Includes "pay of reservists transferred" \$62,188.57 appropriated and expended.

^c Itemized figures of expenditures on an accrual basis are not available.

^d Includes \$16.85 transferred from naval supply account fund.

^e Includes \$1.49 transferred from naval supply account fund.

^f The receipts from sales exceeded by \$2,390.47 the entire contingent and miscellaneous expenditures, \$106,084.46. This amount (\$2,390.47), therefore, plus the entire congressional appropriation and allotment, \$80,461.49, were carried to surplus.

^g Beginning July 1, 1921, all receipts from sales were covered into the Treasury of the United States as miscellaneous receipts.

^h Of this amount \$60,113.43 were transferred from the 1928 appropriation, and \$10,958 from the naval supply account fund.

ⁱ The balance of this appropriation \$24,744.77 was transferred to the naval supply account fund.

^j Of this appropriation, \$28,283.57 were expended in 1920 for printing and publishing.

^k The balance of this appropriation, \$20,509.62 was transferred to the naval supply account fund.

^l Exclusive of \$15,000 transferred to Freight, Bureau of S.

^m Accounts, 1922.

THE HYDROGRAPHIC OFFICE

APPROPRIATIONS AND EXPENDITURES, FISCAL YEARS 1911 TO 1926, INCLUSIVE—Continued.

	1923		1924		1925		1926	
	Appropriation	Expenditure	Appropriation	Expenditure ^b	Appropriation	Expenditure ^c	Appropriation	Expenditure
Salaries, Hydrographic Office.	\$109,540.00	\$105,794.84	\$115,000.00	\$114,539.60	\$300,000.00	\$299,888.66	\$310,000.00	.....
Salaries, additional temporary employees. ^a	109,490.00	109,015.07	.....	875.00	.....	.....	.....	.....
Increase of compensation	41,504.66	41,504.66	40,394.68	40,394.68	.....	.....	.....	.....
Contingent and miscellaneous expenditures, ^e								
Hydrographic Office ...	110,000.00	.....	78,300.00	.....	75,300.00	70,641.50	68,800.00	.....
Branch hydrographic offices.	15,000.00	.....	13,000.00	.....	14,670.00	14,157.29	13,620.00	.....
Employees, branch hydrographic offices.	23,700.00	.....	23,700.00	.....	32,520.00	31,853.52	32,580.00	.....
Total	148,700.00	137,909.80	115,000.00	111,938.87	122,490.00	116,652.31	115,000.00	.....
Allotment, Navy Department. ^a	350.00	313.00	260.00	245.50	310.00	306.63	.....	.....
Ocean and lake surveys.	90,000.00	98,308.29	75,000.00	73,471.37	85,000.00	59,252.67	95,000.00	.....
Public printing and binding. ^a	50,000.00	37,060.26	90,000.00	82,668.54	85,000.00	82,937.50	85,000.00	.....
Total	\$549,584.66	\$488,957.20	\$535,654.68	\$491,040.45	\$592,800.00	\$590,037.77	\$605,000.00	.....

^a Figures obtained from annual reports and records of the Hydrographic Office. Expenditures are not on an accrual basis.^b Expenditure in 1924 and 1925.^c Expenditure figures obtained from annual report of the Hydrographic Office for 1925 and from records of that office.^d Itemized figures of expenditures on an accrual basis are not available.

APPENDIX 6

BIBLIOGRAPHY¹

EXPLANATORY NOTE

The bibliographies appended to the several monographs aim to list only those works which deal directly with the services to which they relate, their history, activities, organization, methods of business, problems, etc. They are intended primarily to meet the needs of those persons who desire to make a further study of the services from an administrative standpoint. They thus do not include the titles of publications of the services themselves, except in so far as they treat of the services, their work and problems. Nor do they include books or articles dealing merely with technical features other than administrative of the work of the services. In a few cases explanatory notes have been appended where it was thought they would aid in making known the character or value of the publication to which they relate.

After the completion of the series the bibliographies may be assembled and separately published as a bibliography of the Administrative Branch of the National Government.

Adams, J. Q. [Remarks on astronomical observatory] (In Congressional Globe, Apr. 28, 1846. v. 15, pt. 1, p. 738)

Claims that appropriation for observatory had been made under head of depot for charts.

Beehler, W. H. Origin and work of the Division of marine meteorology, Hydrographic office. (In Proceedings of the United States Naval institute, 1893, v. 19: 267-281).

Clark, A. H. Navy's oceanographic program. (In Science, n. s. Mar. 13, 1925, v. 61: 269-76).

Corbin, D. F. M. Life of Matthew Fontaine Maury. London, Sampson Low, Marston, Searle & Rivington, Ltd. 1888. 326 p.

¹ Compiled by Sophy H. Powell.

Dutton, A. H. U. S. Hydrographic office. (In Overland monthly, Mar. 1910, n. s. v. 55: 291-2).

Every man to his trade. [Editorial] (In Scientific American, Nov. 30, 1912, v. 107: 454).

Hydrographic office. Should remain with the navy. [Editorial] (In Scientific American, June 4, 1921, v. 124: 442).

Maury, M. F. Letter on observatory addressed to John Quincy Adams. (In Southern literary messenger, Jan. 1848, v. 14: 4-10).

— Petition . . . to the Senate and House of representatives in Congress assembled. Washington? no pub. 1856? 17 p. Appendix 18 p.

Oceanographic survey by the Hydrographic office. (In Science, n. s. July 18, 1924, v. 60, supp: 8).

Quincy, Josiah. Memoir of the life of John Quincy Adams. Boston, Phillips, Sampson and company, 1858. 429 p.

Paulin, C. O. Early movements in the United States for a National observatory. (In Popular science monthly, Oct. 1907, v. 71: 325-336 also Records, Columbia Historical Society, vol. 25).

Southerland, W. H. H. Hydrographic office of the United States. (In National geographic magazine, Feb. 1903, v. 14: 61-75).

U. S. Congress. Joint commission to consider present organization of the . . . Hydrographic office . . . with a view to secure greater efficiency and economy of administration of the public service . . . Testimony . . . 1886. 1104 p. (49th Cong. 1st sess. Senate misc. doc. 82.) Serial 2345

See Hydrographic office, Naval observatory. Nautical almanac office. Bartlett, J. R. Chandler, W. E., etc.

— — — *House. Committee on appropriations.* Navy department appropriation bill, 1923-date. 1922-date.

See Hydrographic office, Bureau of navigation and Naval observatory in index.

— — — — — *Committee on naval affairs.* Depot of charts, etc., to accompany H. R. 303, Mar. 15, 1842. Washington? n. d. 4 p. (27th Cong. 2d sess. House rept. 449.) Serial 408

— — — — — Hearings. Proposed reorganization of the Navy department. 1910. 825 p.

— — — — — Naval affairs estimates, 1907-1923. 1905-1922.

See Hydrographic office, Equipment bureau, Nautical almanac, Bureau of navigation and Naval observatory in index.

— — — — — Report . . . favoring H. 18817, to abolish Bureau of equipment in Department of navy, etc., Jan. 21, 1910. 2 p. (61st Cong. House rept. 293.) Serial 5591

- — — — — Select committee on . . . bequest of James
Smithson . . . Report, Apr. 12, 1842. Washington? no pub.
1842? 103 p. (27th Cong. 2d sess. House rept. 587.) Serial 409
Proposal that Smithsonian fund be used for nautical observatory, p. 37-42
and p. 87-90.
- — — — — Select committee . . . on erection of an obser-
vatory. National observatory, Mar. 18, 1826. Report . . . on
erection of a National observatory. Washington, no pub. 1826?
23 p. (19th Cong. 1st sess. House rept. 124.) Serial 141
— — — — — *Select committee on establishment of Naval ob-
servatory.* Report, Jan. 20, 1813.
(In American state papers, Miscellaneous, v. 2: 197).
- — — — — Report, Feb. 18, 1815.
(In American state papers, Miscellaneous, v. 2: 273-4).
- — — — — *Select committee on Smithsonian bequest.* Re-
port [by John Quincy Adams] Washington, Blair & Rives,
printers, 1835. 155 p. (26th Cong. 1st sess. House rept. 277.)
Serial 370
In which Adams proposes a national observatory.
- — — — — *Senate. Committee on naval affairs.* Hydrographic
office . . . Report . . . [favoring S. 2754 to amend sec. 431
and 432 Revised Statutes relating to Hydrographic office, so as to
transfer office from Bureau of navigation to Bureau of equip-
ment] 1897. 1 p. (55th Cong., 2d sess. Senate rept. 404.)
Serial 3620
- — — — — *Equipment bureau.* Annual report, 1862-1909. 1863-1910.
Since 1886, usually published separately as well as in annual reports of
Navy department.
- — — — — *Hydrographic office.* Annual reports, 1869-1906. 1870-
1907.
In annual reports of Navy department; 1881-1905 issued separately.
- — — — — Founding and development of Hydrographic office by
W. S. Hughes, 1887. 71 p.
- — — — — General catalogue of mariners' charts and books, cor-
rected to Jan. 1, 1925. 1925. 230 p. Branch offices, p. v.
- — — — — Instructions to voluntary meteorological observers of
. . . office by James Page. 1901. 39 p.
(Publication 119).
- — — — — Same. 1904. 40 p.
- — — — — 1925 radio aids to navigation, etc., 1925. 381 p.
- — — — — North Atlantic ice patrols, 1912-1913. 1913. 26 p.

- — Organization and routine of office by G. L. Dyer. 1889. 21 p.
- — Origin and mission of Hydrographic office. 1910. 14 p.
(Hydrographic information 9).
- — Same. Reprint. 1910. 14 p.
- — Same. Revised. 1918. 14 p.
- — Surveys by Hydrographic office, from survey of Georges bank and shoal by Charles Wilkes in 1837 to July 1, 1924, with brief history of earlier surveying expeditions. 1924. 20 p.
- *Naval observatory*. Founding and progress of the United States Naval observatory by J. E. Nourse. 1871. 55 p.
(Appendix IV of Washington observations, Naval observatory, 1871).
- — Same. 1873. 52 p.
- *Navigation bureau*. Annual reports, 1862-1909. 1863-1910.
- — General instructions for hydrographic surveyors of the United States Navy, and for writing and editing sailing directions and for keeping remark books. 1868. 62 p.
In library of Hydrographic office.
- *Navy department*. . . . Estimate of additional appropriations for fiscal year ending June 30, 1892. 1890. 2 p. (51st Cong. 2d sess. House Ex. doc. 79.) Serial 2858
- — Printing and binding for Hydrographic office. [Deficiency appropriation recommended for Hydrographic Office.] 1890. 2 p. (51st Cong. 1st sess. House Ex. doc. 177.) Serial 2746
- — Report of the Secretary of the navy on the construction of the depot of charts and instruments. Feb. 18, 1845. Washington, Gales and Seaton, printers. 1845. 77 p. (28th Cong., 2d sess. Senate doc. 114.) Serial 456
- *Office of naval intelligence*. The United States navy as an industrial asset—what the navy has done for industry and commerce. Revised to July 1, 1924. 1924. 176 p.
- Ordnance and hydrography bureau. Report . . . with . . . estimates for . . . Naval observatory. Sept. 13, 1852. (32d Cong. 2d sess. House Ex. doc. 1, pt. 2.) Serial 674
- *President [Adams] Message* . . . at the commencement of the first session of 19th Congress. Washington, Gales & Seaton. 1825. 20 p. (19th Cong. 1st sess. Senate doc. 2.) Serial 125
- Reference to Astronomical observatory, p. 16-17.
- Same. 19th Cong. 1st sess. House journal, Dec. 6, p. 23-24. Serial 130

- Wilkins, H. T. Sleuth hounds of the sea. (In *Popular mechanics*, Apr. 1925, v. 43: 579-82.)
 Hydrographic work described.
- Winterhalter, Capt. Work of the Hydrographic office as an aid to the maritime interests and to the naval militia. (In *Naval militia association of the United States, Transactions*, Dec. 9, 1909. p. 63-78.)
- Winters, S. R. Weather and the ocean currents. (In *Popular mechanics*, May, 1925, v. 43: 787-90.)
- Wyckoff, A. B. Hydrographic work of the U. S. Navy. (In *Journal of Franklin institute*, May, 1886, v. 121: 349-361.)

BIBLIOGRAPHY

- U. S. Hydrographic office.* Catalogue of charts, plans, and views published by the U. S. Hydrographic office with a list of books sold to agents. 1881. 279 p.
- — — Catalogue of charts, plans, and sailing directions published by the U. S. Hydrographic office. 1884. 196 p.
- — — Catalogue of charts, plans, sailing directions and other publications of the U. S. Hydrographic office. 1887, 101 p.
- — — Same. 1890. 101 p.
- — — — 1891. 106 p.
- — — — 1896. 109 p.
- — — — 1899. 131 p.
- — — — 1901. 119 p.
- — — — 1902. 132 p.
- — — — 1905. 142 p.
- — — — 1907. 152 p.
- — — General catalogue of mariners' charts and books published and sold by Hydrographic office. 1910. 150 p.
- — — Same. 1914. 149 p.
- — — — 1915. 211 p.
- — — — 1917. 203 p.
- — — — 1919. 293 p.
- — — — 1922. 230 p.
- — — — 1925. 230 p.

INDEX

- Academy of Arts and Sciences, 22.
 Activities, 41-58, 79.
 Adams, John Quincy, 5, 7, 8, 16.
 Administration and Finance Section, 60, 73.
 Administration, Division of, 59, 60, 73.
 Aerial Navigation Section, 62, 74.
 Altitude, Azimuth and Line of Position Tables, 88.
 American Ephemeris and Nautical Almanac, 4, 5, 22.
 American Philosophical Society, 4, 22.
 American Practical Navigator, 88.
 Annual Reports, 81.
 Astronomical instruments, first erected in Washington, D. C., 10.
 Astronomical observations, history of, 2-8, 12, 14-17, 20-23.
 Astronomical work of the Depot of Charts and Instruments, 20-23.
 Aviators, Notice to, 87, 88.
 Azimuths of Celestial Bodies, 88.
- Bassett, Frederic B., 40.
 Bessel's Zone Observations, 21.
 Bibliography, 103-107.
 Board of Navy Commissioners, 9, 10, 11, 13, 14, 23, 24.
 Bond, William C., 12.
 Bowditch's American Practical Navigator, purchase of copyrights of, 29.
 Branch hydrographic offices, 36, 50, 57, 70, 71, 77, 78.
 British Admiralty charts, 54.
 British Board of Trade, 37.
 Brooke, John M., 22.
- Carnegie Institution, 49.
 Catalogue and Proof Reading Section, 69, 77.
 Catalogues of stars, 21, 22.
 Chandler, Lloyd H., 40.
- Chart Construction, Division of, 64-68, 74-76.
 Charts: preparation of, 52-56; purchase of plates and copyrights of, 28, 29; equipment of naval vessels with, 56, 57.
 Chart Stock Section, 68, 69, 76.
 Chief of Engineers of the Army, 1, 5, 41, 47, 51.
 Chile, Expedition to, 22, 26.
 Chronograph, first installation of, 22.
 Chronometers, testing and rating of, 9, 10.
 Clover, Richardson, 40.
 Coast and Geodetic Survey, 1, 5, 11, 38, 47, 51, 54.
 Coast Guard, 37, 51, 57.
 Compilation Section, 66, 67, 75.
 Conferences, international, 19, 37-39.
 Construction Section, 65, 66, 75.
 Cooperating observers, 50.
 Cooperation with other agencies, 46, 51.
 Cooper, George F., 40.
 Craig, Joseph E., 40.
 Crosley, W. S., 40.
- Daily memorandum, 87.
 Davis, Chas. H., 40.
 Deep sea soundings, 55.
 De Krafft, John C. P., 40.
 Depot of Charts and Instruments: astronomical work of, 20-23; erection of permanent buildings for, 13-17; establishment of, 8; functions of, 1, 9-15; history of, 8-26; legal status of, 23-26; work of, 17-23.
 De Steiguer, Louis R., 40.
 Development of Great Circle Sailing, 88.
 De Wallenstein, 6.
 Distribution, Division of, 68-70, 76, 77.
 Drafting Section, 67, 75.

- Duplication of meteorological work, 34-36.
 Dyer, George L., 40.
- Emmons, George F., 40.
 Engraving Section, 67, 75.
 Establishment of Hydrographic Office, 26, 41.
 Exchange of publications with foreign services, 37.
 Executive heads, 39, 40.
 Exploring expeditions, 11-13, 19, 22, 26, 29, 48. *See also* Hydrographic and topographic surveys and explorations.
- Files and Archives Section, 60, 73.
 Fillebrown, Thomas S., 27, 40.
 Financial Statement, 95-102.
 Foreign states, surveys in territorial waters of, 49.
 Foreign waters, charts of, 52-54.
 Franklin, Samuel R., 40.
 Functions of Depot of Charts and Instruments, 1, 9-15; Hydrographic Office, 1, 27, 28, 41-47.
- General Administration Section, 60, 73.
 General Catalogue of Mariners Charts and Books, 88.
 Gilliss, James M., 11-13, 16, 17, 20, 22, 23, 26, 40.
 Gnomonic charts, preparation of, begun, 30.
 Goldsborough, Louis M., 9-11, 23, 40.
 Greenwich, Meridian of, 2, 4.
 Guam, survey of harbor at, 31.
- Harrison, Napoleon B., 40.
 Hassler, Ferdinand R., 11.
 History of Depot of Charts and Instruments, 8-26; Hydrographic Office, 26-40.
 Hodges, Harry M., 40.
 Hydrographer, Office of the, 28, 59, 73.
 Hydrographic and topographic surveys and explorations, 11-14, 17-20, 22, 26, 29-33, 41-43, 47-50.
 Hydrographic Bulletin, 86, 87.
- Hydrographic Charts, 81-83.
 Hydrographic information, collection and distribution of by radio, 46.
 Hydrographic information to be furnished by commanding officers of ships, 42, 45.
 Hydrographic Notices, publication of, begun, 29.
- Ice patrol, 37, 57, 58.
 Ice Supplement to North American Pilot Chart, 87.
 Interdepartmental board to consider duplication of meteorological work, 34.
 International Code of Signals, 88.
 International conferences, 19, 37-39.
 International Hydrographic Bureau, 38, 39, 51, 56.
 International ice patrol, 57.
 Issue Section, 69, 77.
- Japan, Perry's expedition to, 18, 26, 29.
- Knapp, John J., 40.
- Lalande's Catalogue, 22.
 Lambert, William, 2-5.
 Laws, 90-94.
 Legal status of the Depot of Charts and Instruments, 24-26.
 Light Houses, Bureau of, coöperation of, 51.
 Light Lists Section, 62, 74.
 List of Lights, 85.
 Lithographic Section, 67, 68, 75, 76.
 Longitude determinations, 2, 3, 4, 12, 30, 50.
- MacMillan polar flight expedition, 56.
 Macomb, A., 5, 6.
 Magnetic Work, 12, 14, 15, 17, 18, 33, 34.
 Mailing Lists Section, 69, 70, 77.
 Manuals, 88, 89.
 Maps, purchase of plates and copyrights of, 28, 29.
 Mariners, coöperation of, 51.

- Maritime Security, Division of, 61-63, 72, 74.
Maury, Matthew F., 16-20, 23, 40.
Meridian of Greenwich, 2, 4.
Meridian of Washington, 2-4.
Meteorological work, 12, 14, 15, 17, 18, 20, 23, 26, 33-36, 43.
Mine Warnings, 88.
Minor planets, discovery of, 23.
Mixed Claims Commission after World War, 56.
Monaco, *See* International Hydrographic Bureau.
Monroe, James, 2, 3.

Nautical Data Section, 62, 73.
Nautical publications, preparation of, 52-56.
Nautical Research, Division of, 63, 64, 74.
Naval Observatory, 1-8, 27, 56.
Naval officers, hydrographic work of, 42-45.
Naval vessels, equipment of, with navigational information, 56, 57.
Navigational information: collection of, 50-52; dissemination of, 36, 37, 56-58. *See also* Publications.
Navigation, Bureau of, Navy Department, 1, 24, 41, 42.
Neptune, discovery of, 22.
Noon Interval Tables, 88.
North Pacific and Arctic Surveying Expedition, Rodgers, 18, 19, 22, 26, 29.
Notice to Aviators, 87.
Notice to Mariners, 29, 86.
Notice to Mariners Section, 62, 74.

Ocean and lake surveys, appropriations for, 30, 31, 41.
Ocean and Lake Surveys Section, 65, 74.
Ocean currents, information concerning, 51.
Ordnance and Hydrography, Bureau of, 24.
Organization, 59-78.

Pacific Ocean and South Seas Exploring Expedition, Wilkes, 11-13, 26.

Paraguay Expedition, 26.
Pearl Harbor, Hawaiian Islands, survey of, 31.
Perry, Matthew C., 18, 26, 29.
Picking, Henry F., 40.
Pilot Charts, 29, 35, 36, 83, 84.
Pilot Chart Section, 62, 63, 74.
Publications, 27, 29, 37, 41, 44, 54, 55, 58, 80-89.
Purchase and Supplies Section, 61, 73.

Radio Aids to Navigation, 85.
Radio, collection and distribution of hydrographic information by, 46, 51.
Reconstruction Section, 66, 75.
Reorganization of Hydrographic Office, 28.
Revenue-Cutter Service, 37. *See also* Coast Guard.
Ringgold, Cadwalader, 19.
Rodgers, John, 18, 19, 22, 26, 29.
Rogers, Charles C., 40.
Route Information Section, 63, 74.

Sailing Directions, 18, 28, 29, 84.
Sailing Directions Section, 63, 74.
Sales agencies for hydrographic publications, 57.
Schroeder Seaton, 40.
Secretary of the Navy, 6, 10, 12, 14, 16, 18, 22, 24.
Shenandoah, U. S. S., 55.
Signal Service, *See* Weather Bureau.
Sigsbee, Charles D., 40.
Simpson, Edward, 40.
Simultaneous Altitudes and Azimuths of Celestial Bodies, 88.
Smithsonian Fund, 7, 8.
Snowden, Thomas, 40.
Solar Azimuth Tables, 88.
Sonic depth finders, use of, 49.
Southerland, William H. H., 40.
Standards, Bureau of, 37.
Stars, catalogues of, 21, 22.
Star Identification Tables, 88.
Struve's Dorpat Catalogue of double stars, 21.
Summer Line of Position, 88, 89.
Superintendent of the Naval Observatory, 25.

- Supplements to Sailing Directions, 85.
Survey of the Coast, *See* Coast and Geodetic Survey.
Surveys, *See* hydrographic and topographic surveys.
Tables of Distances, 88.
Telegraphic cable companies, cooperation of, 48.
Todd, Chapman C., 40.
Transfers of Hydrographic Office, 28.
Troughton, Edward, 11.
Van Buren, Martin, 7.
Walker, Sears C., 22.
War activities, 20, 39.
Washington, meridian of, 2-4.
Washington Observations, 21.
Washington, Thomas, 40.
Weather Bureau, 24-36, 51.
Wilkes, Charles, 11-13, 17, 23, 26, 29, 40.
Wind and Current Charts, 17, 18, 26.
Winterhalter, Albert G., 40.
Wyman, Robert H., 40.